



FRIDAY, NOVEMBER 30, 1877.

Van Liew's "Self-Adjusting" Grain Door.

In carrying grain in bulk in railroad cars, it is important that the doors should be closed up tight, so as to prevent the grain from leaking out. A great many devices have been employed for this purpose. The one which is illustrated by our engravings herewith has come into extensive use, which is good evidence of its value and effectiveness.

The engravings consist of an elevation, fig. 1, looking from the inside of the car at the door; fig. 2, a transverse section; fig. 3, a sectional plan, and fig. 4, a section on an enlarged scale of the attachment or pivot of the links or "carriers" *EF* and *E'F'*, which support the door *ABCD*. These carriers are arranged somewhat like the links of a parallel ruler, and the door is supported on them as shown in fig. 1, in which it is represented in the position it occupies just before being closed. The dotted lines *Ff* and *F'f'* represent the position of the carriers when the door is opened. Its operation is very apparent from the engraving. When it is opened it assumes the position represented by the dotted lines, and the door then rests against the bracket casting *7*. When it is closed, the upper ends of the carriers move in the arcs of circles *fE* and *f'E'*,

Q—Flush lift on outside of door to pry it open.
a a'—Door posts.
b b'—Inside lining.
c c'—1 inch rabbet to fit door shoe.
d d'—1 inch rabbet to fit bracket *7*.
e e e'—Lift holes to take hold of in raising the door.
f f'—Position of carriers when the door is open.
m m'—Bearing irons for locks.
n n'—Hoop iron to protect the door and prevent persons from sawing openings in it.

The door is extensively used on the grain-carrying roads, especially in the West, and as we have already stated, this general use is perhaps the strongest argument in its favor. It is the invention of Mr. D. F. Van Liew, of Aurora, Ill., who may be addressed for further information.

Contributions.

The Strains on Counter Braces of Truss Bridges.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I noticed in the *Gazette* of Nov. 23 that Mr. Ches. E. Emery reiterates his statement made in a former number, that "it may be laid down as a general rule that the strains on a structure due to internal tension (or those induced by the simple tightening of the members one upon another as distinguished from those arising from the transfer of the external load from one point to another) are not increased by the action of external loads inducing strains of less intensity. I cannot agree with Mr. Emery, and though I thought his error plainly dis-

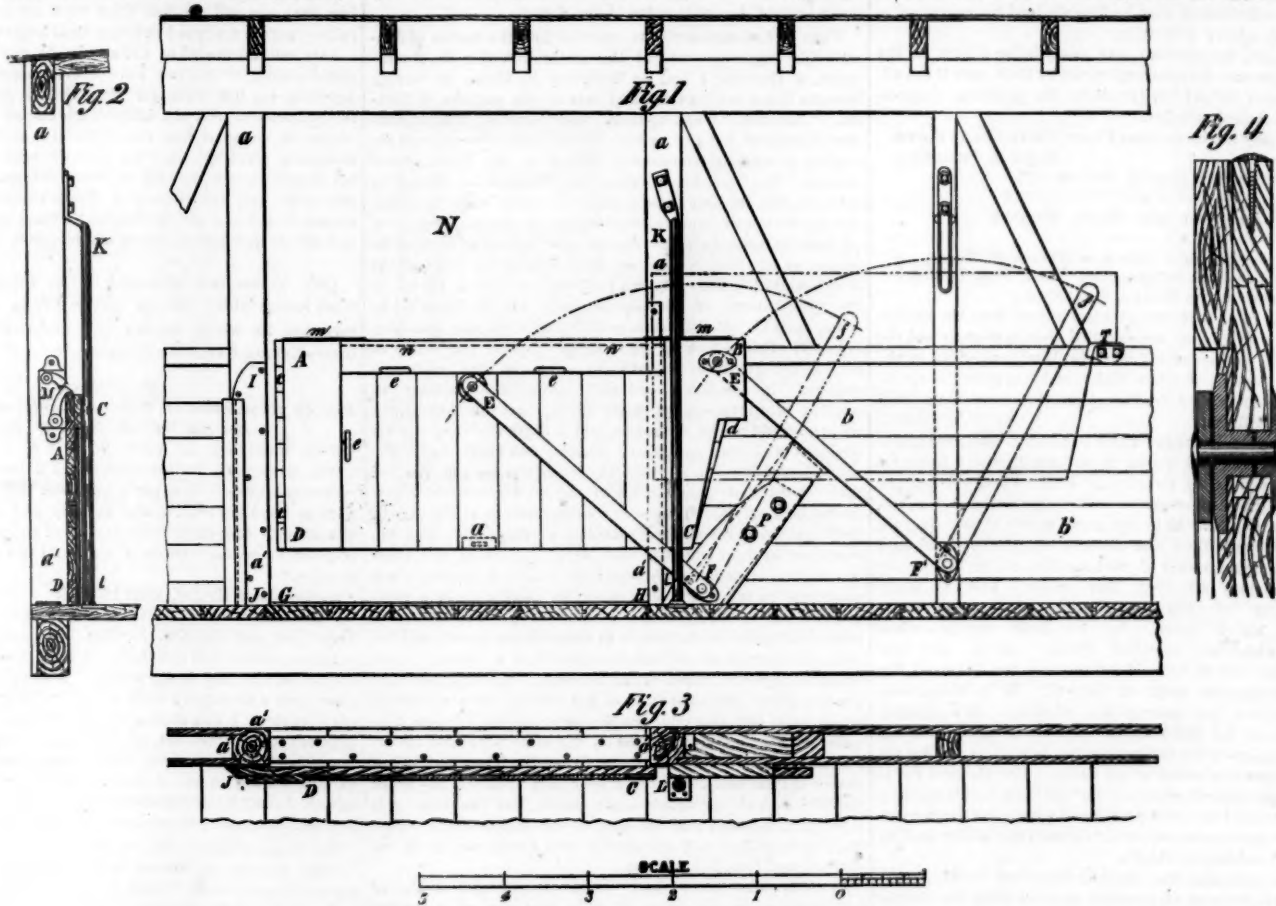
words, they vanish when the compressed parts are elongated to their normal length, which involves generally but a very slight change of length. But *all* the parts in a truss bridge are subject to such change of length under strain, the counter-braces themselves as well as the parts under compression.

The force of gravity, on the other hand, is practically uniform through such spaces as we deal with, for though it varies inversely with the square of the distance from the earth's centre, such variation concerns astronomers rather than engineers, who, for the present, have not undertaken any public works in the moon.

In order to exemplify the forces arising from the elasticity of compressed metals, let us construct an apparatus as follows, viz.: Take an ordinary spring balance, such as is used by fish peddlers, but capable of gauging tension up to 25 lbs. with tolerable accuracy. (Case I.) Suspend it to a horizontal fixed beam and hang a weight of 10 lbs. to its lower end. The apparatus will elongate till the index points to 10. (Case II.) Now hang another similar balance to the lower end of the first one, say to the bottom of the 10-lb. weight, and suppose this balance itself weighs 0.1 lb. Attach to the lower end of the lower balance a weight of 2 lbs. The index of the lower balance would point to the figure 2 and that of the upper one to 12.1.

(Case III.) If we now hang another weight of 1 lb. to the hook at the bottom of the upper balance, the upper index will drop to 13.1 while the lower one will not move on its plate.

But suppose instead of the above arrangement, we have the following one: Hang the two balances one below the other as before, with the 10 lbs. weight on the upper one, otherwise



VAN LIEW'S "SELF-ADJUSTING" GRAIN-CAR DOOR.

also shown by dotted lines. When closed the bottom edge, *DC*, of the door rests on the sill *GH*, and the left-hand edge *AD* fits into a cast-iron "shoe" *IJ*, the form of which is shown in section in fig. 3, and which is bolted or screwed fast to the door post. It will be seen then that when the door is closed its own weight keeps it down on the sill *GH*, and also, owing to the action of the carriers, causes it to bear laterally against the shoe *IJ*. As an additional security locks, *M*, fig. 2, are attached to each door post to secure the door in its closed position, or hold it down. *KL* is a guide bar to hold the right-hand side of the door against the door post.

It will be noticed that the grain door is only 2 ft. 6 in. wide and is intended only to close up the lower portion of the door opening, and thus prevent the grain from leaking out. After the grain is loaded the outside door, which is never tight, is closed to protect the grain from the weather, and is locked to prevent it from being stolen. When the car is used for carrying other kinds of freight, the grain door is thrown over into the position indicated by the dotted lines.

The following letters of reference and description of the parts they designate may help to make the construction of this door more clear:

- ABCD*—Grain door.
- EF* and *E'F'*—Carriers for door.
- GH*—Door sill, or wrought-iron threshold.
- IJ*—Door shoe to receive the front end of door.
- KL*—Guide-bar to hold the door against the side of car.
- M*—Door lock.
- N*—Door-way.
- O*—Guide-arm to hold the door against the side of the car.
- P*—Foot support for attaching the carriers *EF* and supporting the door when open.

proved by Mr. Cooper's letter in the *Gazette* of Nov. 2, and Mr. Flagg's in the issue of Nov. 9. Since Mr. Emery invites further discussion, I will try to throw more light on the subject. To begin with the illustration you give in the *Gazette* of Nov. 23, where a horse is shown pulling against a post. Suppose that before the horse begins to pull the man were to put his feet up, or one foot if strong enough, and brace it against the whiffle-tree. I suppose it will be generally admitted that the part of the rope between the man's hands and the whiffle-tree is strained as much as he pulls, say 300 lbs., while the remainder of the rope is strained only by the dead weight of the apparatus.

Now here is a structure, with an "internal tension" induced by the tightening of the members one upon another. Now let us add an external load of less amount by starting the horse gently and letting him pull 100 lbs. The portion of rope between the man and the post will now be strained 100 lbs. Will not that part between the man's hand and the whiffle-tree be strained 400 lbs.? If not, then all the iron bridges in the world which increase the section of their chords from the ends of their spans toward the centre must be built under an entire misapprehension and waste an untold amount of iron; for what difference does it make to the middle part of the rope, in the above case, whether the initial strain be "internal," or whether it be produced by two men pulling from one another, one at the whiffle-tree and the other in the original position shown in your cut, with all their legs on the ground?

The strains produced by tightening the counter-braces of a bridge, however, are slightly different from that produced by the man on the rope in the above case, in this respect, that they arise from the elastic force of the compressed members, and are not capable of extending far in space; or, in other

unloaded. Attach to the under side of the beam, say 3 in. each side of the point where the balances hang, a vertical coil of steel wire, coiled open, so as to allow of compression endwise, and let the springs extend down a little below the bottom of the balances. Connect the lower ends of these springs with a cross-head under the balances with guide rods passing up through its ends, through the coils and into the beam. Instead of hanging a 2 lbs. weight to the lower balance, as in Case II., let us tie the lower end of the balance to the cross-head (Case IV.), and shorten the attachment, compressing the outside springs till the index of the lower balance reads 2. It is evident that the upper index will now point to 12.1, as in Case II. We here have a structure with "internal tension induced by the simple tightening of the members one upon another" to the extent of 2 lbs.

Let us proceed to put on an "external load" (Case V.), by hanging a weight of one pound alongside the 10 lbs. weight between the balances. If Mr. Emery's statement be correct, this external load will supplant one-half the 2 lbs. downward force exerted by the outside springs on the cross-head, and the upper balance would suffer no change, while the lower one would read 1 lb. instead of 2 lbs. as before. But in this case we must suppose the outside springs relieved of one-half their compression, under which circumstances they would elongate, which involves lowering the cross-head, and the lower end of the lower balance which was tied to it, an amount equal to this elongation. Moreover, the lower balance is supposed to lose one-half its tension when the 1 lb. weight is hung on above it, so it must shorten to allow the index to fall 1 lb., and its upper end would therefore fall still more than its lower one. But the upper end cannot fall without producing additional tension in the upper balance, which in fact

efficient." This certainly is a very sudden and radical change of opinion.]

Extracts from a letter of A. E. Mitchell, General Superintendent of Lough Valley Railroad, to W. W. Evans, dated, March 18, 1872.

"The Fairlie Engine 'Janus' has not satisfied me of her superior qualities over the old system. * * * I endorse statement of trial made on a steep grade, where with 130 lbs. pressure, she developed 13½ net tons tractive power, the eight-wheeled connected 20x24 in. cylinders developing 11½ tons. The steam pipes have given much trouble from leakage, and I question their ever being kept tight. They are not to be depended on. * * * Could not recommend their adoption by any person or company."

Extract from a letter of the Works Manager of an important railway in England to W. W. Evans, dated Dec. 22, 1876:

"I certainly do not know any first-class builder — or second, for the matter of that—who gives his influence or support to Fairlie engines. I had hand in making some once, and hope never to see them again."

Extracts from a letter of J. F. Flagg, C. E., to W. W. Evans, dated Meadville, Pa., Dec. 3, 1876:

"The maximum grade of the Iquique Railway in Peru is 4 per cent, the curves severe and frequent, radii of curves being 370 to 570 feet, elevation overcome in first 17 miles being 2,900 feet. * * *

"Mr. Cleminson came out in 1872 as an agent of Fairlie's and was put in charge of the locomotive and machinery department. * * *

When he first took charge there were two Rogers, three English and two Fairlie engines on the road. * * *

The latter rarely took much above 115 tons besides their own weight to San Juan (22 miles, elevation 3,165 ft.); then the trains were frequently doubled to La Noria, and 15 to 20 cars, loaded, brought back on return trip. * * *

In July, 1873, they had nine Fairlie engines. They had 15x22 in. cylinders, 3 ft. 6 in. driving wheels, and weighed 58 tons loaded. * * *

I am convinced that the running expenses of the Fairlie engines (independent of their repairs) for fuel, water and labor were much higher per ton of freight moved than for the Rogers engines."

Of this letter Mr. Evans says: "Mr. Flagg was in the employ of the Mentow Brothers (owners of the Iquique Railway), in charge of constructing nitrate of soda works on the plains of Tarapaca, Peru, and was often over the Iquique & La Noria Railway when the Fairlie engines were used."

SALISBURY IRON.

III.

In order to determine the character or capacity of any kinds of iron to resist strains, it is important to know not only that they possess certain properties, such as a high tensile strength or ductility, that is capacity of stretching before breaking; but it is also important to know the manner in which these and other qualities are combined in any given specimen. For the purpose of determining the character of Salisbury iron, in an exact and scientific way, the Barnum Richardson Company recently submitted to Professor Thurston, of the Stevens Institute of Technology, specimens of their iron to be thoroughly tested in the Mechanical Laboratory connected with the Institute. These specimens are described as follows in his report:

"MECHANICAL LABORATORY, DEPARTMENT OF ENGINEERING, STEVENS INSTITUTE OF TECHNOLOGY, HOBOKEN, N. J., October, 1877.

"Barnum Richardson Company, Lime Rock, Conn.,

"GENTLEMEN: I have the honor to submit the following report on tests of three bars of No. 2 and of three bars of No. 4 Salisbury cast iron. The bars when received were given laboratory numbers as follows: Bars of No. 4 iron were marked 1,018, 1,019 and 1,020; bars of No. 2 iron were marked 1,049, 1,050 and 1,051. The results of the tests are recorded in detail on the accompanying record sheets.

"The bars, figs. 16 and 17, were 24 in. long and one inch square in section. They were first broken by transverse stress, the distance between the supports being 22 inches.

"The bars of No. 4, iron, after having been subjected to test by transverse stress were broken at a a', in fig. 16; a piece one half inch long was cut from the part a b at a, and another from a d, at d, and used for determining the specific gravity of the material. From the piece a b a tension piece was turned, the heads of which were afterwards worked into

specimens to be tested by torsion in the Autographic Recording Testing-Machine. The compression specimens were taken from the piece a d.

"When the bars of No. 2 iron had been broken at a a' (fig. 17), by transverse stress, the two pieces from each bar were cut up as indicated in fig. 18; the piece a b furnishing a tension specimen and a piece of which the specific gravity was determined; while the piece a d furnished one tension and one compression specimen and two pieces used in determining the specific gravity of the bar."

The ore used in the manufacture of the test pieces was chiefly "Old Hill," with about 2 per cent of Arsenia. About 2½ lbs. of ore were used per lb. of iron, and 102½ bushels of charcoal per ton (of 2,240 lbs.) of iron. The pressure of the

portant to know the amount which it will deflect or bend under certain loads, because this indicates either the toughness of the material or the reverse quality of stiffness. After the material has been subjected to a strain and the load removed, it should be known whether it recovers its original form or is permanently bent or "set" by the strain imposed on it. If a strain produces a permanent bend or "set," it indicates that some molecular change has taken place in the material, or that disintegration of the particles has commenced, so that it would not resist such strains if they were often repeated. It is therefore very important to establish the "elastic limit," as the maximum strain is called, which will not produce a permanent set. For this reason, in testing this iron the deflections and also the amount of permanent set were very carefully observed, and the method of doing this is described as follows:

"The deflections were measured directly from the cross-head by a micrometer-screw firmly attached to the platform of the machine by an upright iron rod. By means of an electric contact apparatus the deflection is determined very accurately to 1/1000 of an inch. The instant of contact is made known by the ringing of a bell placed in the circuit, one wire being attached to an insulated bearing on the cross-head, and the other to the machine, so that when the micrometer touches the insulated bearing the circuit is complete."

"In the columns headed 'Proof Stresses, Absolute; P' of the transverse record sheets accompanying this report, are recorded the loads which were imposed up to that causing rupture, which latter is recorded in the column headed 'Breaking Load, Absolute; P'—in each case the load including the weight of the bar.

"At every increase of 200 pounds in the load, the specimen was relieved from stress and the amount of permanent set was measured. The deflections, in inches, are noted in the column headed 'Deflections, Absolute; δ' of the record sheets, on a line with the loads producing them.

"The results of these tests are also represented graphically by plotted curves in fig. 19; the ordinates, or vertical distance from the horizontal line at the bottom of the figure, represent the loads, and the abscissas, or horizontal distance from the left-hand vertical line, measure the corresponding deflections of the bar. The points marked "•" and "○" are representative of the observations recorded with each specimen of the same grade of metal, and the curve gives the mean of all observations. The upper curve of deflections represents No. 4, and the lower one No. 2 iron. The curves of sets for the two kinds of iron have also the same relative position to each other."

If a bar of iron similar to that represented in the testing machine in fig. 18, and also in fig. 20 is subjected to transverse stress, the effect is, that the upper portion of the bar at a will be subjected to compressive strains while the lower portion at b will be strained in tension. If the bar should be broken it will be observed that a sort of triangular shaped portion, a, which is shaded in fig. 20 will be crushed and compressed, and the lower portion of the bar at b will be stretched, and if the bar breaks at that point it will be torn apart as shown in fig. 20. It will not be necessary to demonstrate that when a bar is subjected to transverse stress the portion of it nearest the edge at the top and bottom is strained most, and that the strains diminish towards the centre of the bar, where we reach a point, which is called the "neutral axis," where the strains cease and where the material is not subjected to any stress. The nature of these strains has been very carefully analyzed by those who have investigated this subject, with a view,

among other things, of determining the maximum strains which the particles of the bar are subjected to under a given load. Thus if the bar should break or be torn apart at its lower edge, b, as already indicated, it is evident that the particles of iron in the lower edge of the bar were subjected to the greatest strain, and were the first to separate or break. The same thing would be true if the bar failed from crushing at the top, in which case its upper edge would have been subjected to the greatest strain of compression. Now when a bar is loaded in this way up to the limit of elasticity, it is desirable to know what is the maximum amount of strain per square inch of section that the particles or fibres of the iron at the edges of the bar which are strained the most then bear. This

* A method devised by Professor Mayer. † The record sheets referred to are very voluminous, and would occupy more space than can be devoted to them in these pages. The results are, however, represented graphically in fig. 19, which will be explained hereafter.

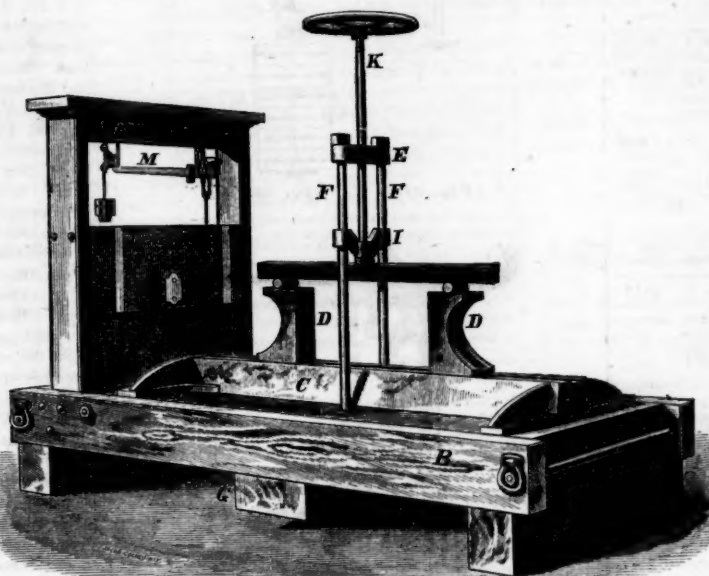
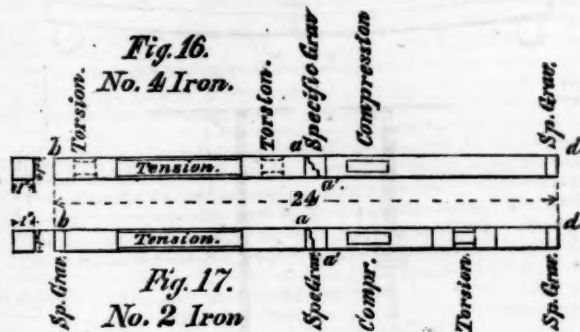


Fig. 18.

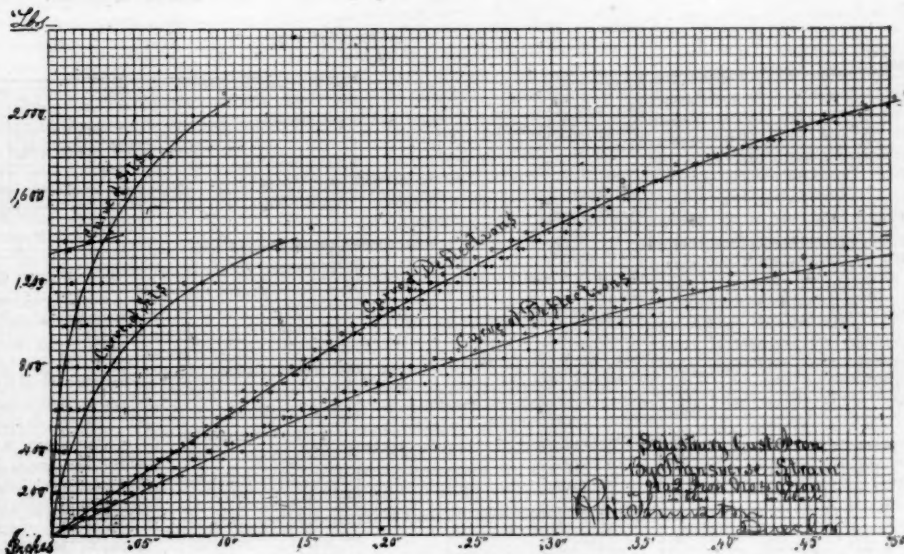


Fig. 19.

The lower Curve of Deflections represents No. 2 iron; the upper Curve of Deflections for No. 4 iron.

blast was 70 lbs. per square inch, and its temperature 425 degrees.

TESTS BY TRANSVERSE STRESS.

"The transverse tests of the bars were made on a machine (fig. 18) built for the Mechanical Laboratory by Messrs. E. & T. Fairbanks & Co.

"The machine consists of a platform scale, A B, fig. 18, provided with two cast-iron supports, D D, sliding in grooves on a strong iron beam C, firmly fastened to the platform. The bar L is placed on these supports, which are fixed at the required distance apart, and the pressure is applied by means of a screw, K, driving a cross-head, I, which serves as guide, and transmits the pressure to the surface of the bar under test. The cross-head is guided by rods, F F, supporting the beam E, in which the screw works. These rods pass through the platform of the scale and take hold of a cross-beam, G, attached to the frame of the machine in such a manner that when a pressure is applied by the screw it is transmitted by the specimen under test to the supports on the platform, and its amount is read off on the scale-beam M."

In determining the quality of iron or other material it is im-

maximum strain per square inch of section is called the "modulus of proof stress." If the bar is broken then the stress per square inch of section on the upper or lower edges of the bar is called the "modulus of breaking load or of rupture." This is defined in Wood's "Treatise on the Resistance of Materials" as "the strain at the instant of rupture upon a square inch of fibres most remote from the neutral axis on the side which first ruptures." He adds further that "it would seem from this definition, that it should equal either the tenacity or crushing resistance of the material, depending upon whether it broke by crushing or tearing, but an examination of the table shows the paradoxical result that it never equals either, but is always greater than the smaller and less than the greater."

It would lead us too far to explain the method of calculating these moduli. They have, however, been worked out by Professor Thurston as follows:

"The 'modulus of proof stress,' or of load for the elastic limit, and the 'modulus of breaking load or of rupture,' are found by the formulas:

$$R' = \frac{3 P l}{2 b d^3} \text{ and } R = \frac{3 P}{2 b d} \text{ respectively,}$$

where P represents the load at the elastic limit, P the breaking load, l the length or distance between the supports, and b and d the breadth and depth of the bar respectively.

The following tabulated statement gives concisely the transverse resistances, at the elastic limit and at the points of rupture, their corresponding moduli, and the deflections produced at their loads:

Laboratory number.	ELASTIC LIMIT.					
	Absolute load.		Modulus of stress.		Deflection.	
	P .		R .		δ .	
	No. 4.	No. 2.	No. 4.	No. 2.	No. 4.	No. 2.
1,018.....	Lbs.	Lbs.	Lbs.	Lbs.	Inches.	Inches.
1,019.....	600	.....	19,800	.....	0.1146	.....
1,020.....	600	.....	19,527	.....	0.1119	.....
1,020.....	600	.....	19,261	.....	0.1055	.....
1,049.....	.....	320	.....	10,613	.....	0.0895
1,050.....	.....	30	.....	10,581	.....	0.0737
1,051.....	.....	320	.....	10,549	.....	0.0737
Average.....	600	320	19,529	10,581	0.11066	0.0789

Laboratory number.	ULTIMATE.					
	Absolute Load.		Modulus of Rupture.		Maximum Deflections.	
	P .		R .		δ .	
	No. 4.	No. 2.	No. 4.	No. 2.	No. 4.	No. 2.
1,018.....	Lbs.	Lbs.	Lbs.	Lbs.	Inches.	Inches.
1,019.....	2,000	.....	66,000	.....	0.4738	.....
1,020.....	2,087	.....	67,691	.....	0.5140	.....
1,020.....	2,100	.....	67,412	.....	0.5174	.....
1,049.....	.....	1,320	.....	43,735	.....	0.5128
1,050.....	.....	1,370	.....	45,482	.....	0.5393
1,051.....	.....	1,490	.....	49,064	.....	0.5500
Average.....	2,050	1,383	67,035	45,760	0.5017	0.5340

The reader will see that, having these "moduli" given, the resistance at the elastic limit of any bar or beam made of the iron of which the modulus is given can be calculated by simply inserting in the equation,

$$P' = \frac{R b d^3}{3 l}$$

*See Wood's "Resistance of Materials," 3d edition, p. 154, equation 149.

he value of R , the modulus of proof stress, and for b and d the breadth, depth and length of the beam in inches.

The load which the beam will carry without breaking is also evidently obtained by inserting the proper values, including the "modulus of rupture," in the equation,

$$P = \frac{R b d^3}{3 l}$$

Again: the modulus of elasticity or of rupture represents the load that will strain, or will break, a beam one inch long and an inch square in sections.

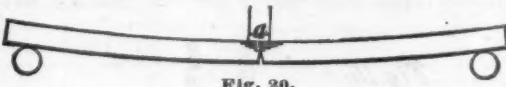


Fig. 20.

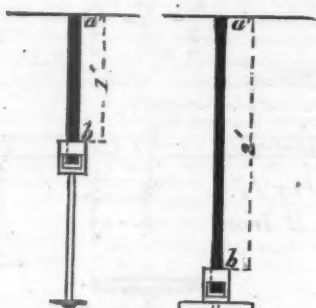


Fig. 21.



Fig. 22.

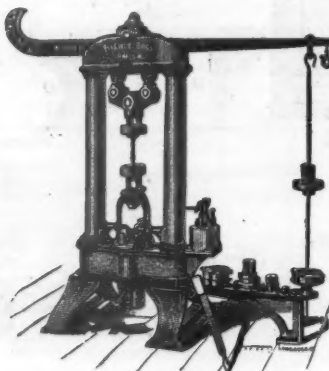


Fig. 23.

THE MODULUS OF ELASTICITY.

It has been found by experiment that if a bar of iron is stretched or compressed by a force which does not exceed half the elastic limit, a force twice as great would stretch or compress the bar twice as much; or, in other words, the amount of extension or compression of a bar of iron, within the elastic limit, is proportional to the forces which produce the elongation or contraction of the bar. The amount which any material will be elongated by a given force varies with the quality of the material, and must be determined by experiment. In order to have a measure of the elasticity, or of the resistance of a material to being stretched or compressed, what is called the "modulus of elasticity" has been adopted. This is to some extent a purely imaginary quantity, and means "the number of pounds per square inch of section to stretch or compress a specimen to twice, or to one half, its original length, provided that it could continue to stretch or to shorten at the same rate, as within the elastic limit." Thus suppose we took a piece of india rubber one inch square and one foot long and suspended it by the upper end, as shown in fig. 21, and attached a scale pan to receive weights at the lower end, leaving the distance between the points a and b by which it is attached just equal to 1 ft. If now we put a weight of one pound in the pan we shall find that it will stretch the rubber $\frac{1}{4}$ in., two pounds will stretch it $\frac{1}{2}$ in., and three pounds $\frac{3}{4}$ in., and so on, and 96 lbs. will stretch it so that the distance between the attachments a and b , fig. 22, will be two feet, or double the original length. Now this latter weight would be the modulus of elasticity of the rubber. If we attach a bar of iron in the same way and loaded it, it will stretch a certain amount, and if we double the load, it will stretch the bar twice as much, or, as explained before, the amount of extension or "stretch" will be proportional to the load. There will, however, be this difference between the iron and the rubber: If the weights are removed from the latter after it has been stretched to twice its length, it will recover its original dimensions, whereas if the iron is stretched only a small fraction of its length it reaches its limit of elasticity, and it will then be permanently injured if extended beyond that point. In calculating the modulus of elasticity of iron and other metals, the amount that it is stretched or compressed by a force within the elastic limit is taken, and from that is calculated how much force would be required to stretch it to double its length provided it continued to elongate at the same rate, as it is found by experiment to do within the elastic limit. Thus suppose a bar of iron one foot long to be stretched $\frac{1}{100}$ in. by a stress of 10,000 lbs. per square inch; then 20,000 lbs. will stretch it $\frac{2}{100}$ in. and 30,000 lbs. $\frac{3}{100}$ in., and so on; and therefore if we divide the length of the bar by the extension and multiply it by the force applied, we will have the modulus of elasticity. In this case it would be $\frac{1}{100} \times 10,000 = 100,000$ the modulus of elasticity. The latter, as its name indicates, is a measure of the resistance of any material to stretching. The modulus of rubber which can be stretched very easily, is only about 96; that of lead, 720,000; glass, which stretches very little, 8,000,000; cast iron, as given above, about 12,000,000; and wrought iron, 29,000,000. It should be clearly understood, that this modulus does not indicate the amount which a material

* The experiments to determine the modulus of rubber were very rude, and the above figures are used only for purposes of illustration and should not be regarded as correct without further and more accurate experiments.

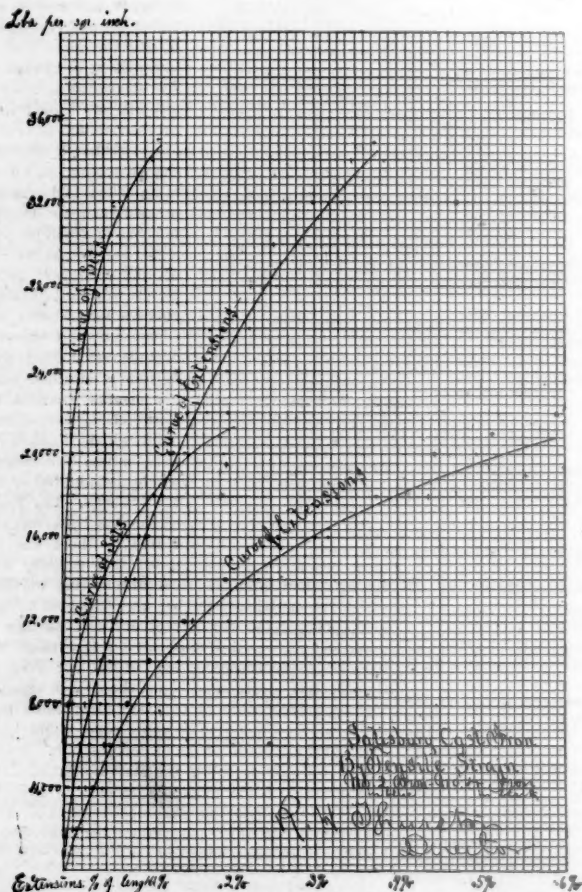


Fig. 24.

The lower and right-hand curves of Extensions and Sets are No. 2 iron; the upper and left-hand curves represent No. 4 iron.

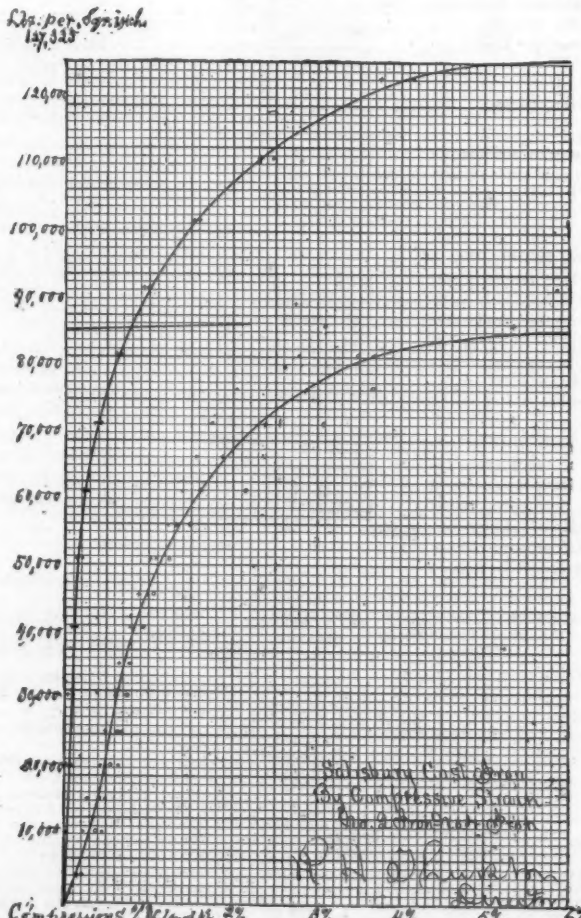


Fig. 25.

The lower curve represents No. 2 iron; the upper one No. 4.

can be stretched without injury, or its limit of elasticity. Neither does it indicate the ultimate strength or tenacity of a material, because there is no known relation between the elasticity of materials and their tenacity. It simply indicates the resistance which a material offers to being stretched within the elastic limit.

To explain the method of calculating the modulus of elasticity from tests by transverse stress would occupy more time and space than could be devoted to it here, and therefore the reader is referred to the references given in the following portion of the report for fuller information on these points:

"The modulus of elasticity is found by means of the equation:

$$E = \frac{P \cdot l}{\delta \cdot I}$$

when P = any load within the elastic limit, δ = the corresponding deflection, l = the length between the supports, and I = the moment of inertia, which for a rectangular beam is

$$I = \frac{1}{12} b d^3$$

when b and d are the breadth and depth respectively of the beam.

"For the values of the moduli of elasticity in the cases of the specimens of cast iron under consideration, the following table will be found of assistance in forming comparisons in this respect:

MODULUS OF ELASTICITY.

Laboratory numbers.	No. 4 iron.	No. 2 iron.
1,018.....	13,786,909	.....
1,019.....	14,766,726	.....
1,020.....	14,446,212	.....
1,049.....	.....	9,715,328
1,050.....	.....	11,484,037
1,051.....	.....	11,000,000
Average.....	14,333,302	10,733,121

RESILIENCE.

Resilience is the quantity of mechanical work which is exerted to stretch or compress a bar up to its elastic limit, and represents the toughness of the material, that is, its capacity to resist stress and its flexibility combined; hence any material which bears the greatest load and, at the same time, bends or is extended or compressed the most before reaching the elastic limit has the greatest amount of resilience, or is the toughest. It is always measured by the product obtained by multiplying the mean resistance to stretching by the distance through which that stretch takes place. Or, to state it in the language of the report of Professor Thurston:

"Resilience represents the number of foot-pounds of work done in straining the specimen to its elastic limit and to the point of rupture, respectively. This measures the capacity of the metal to resist shocks.

"The following figures of the elastic and ultimate resiliences are taken from the record sheets appended to the report.

"The specific gravity of the metal is also given and is the average of determinations of specific gravities of pieces taken from the ends and from the middle of the different bars, as shown in figs. 16 and 17.

RESILIENCE AND SPECIFIC GRAVITY.
Resiliences given in foot-pounds.

Laboratory Number.	Elastic.		Ultimate.		Specific Gravity.	
	No. 4.	No. 2.	No. 4.	No. 2.	No. 4.	No. 2.
1,018.....	2.86	.....	48.5	.....	.....	.....
1,019.....	2.79	.....	48.45	.....	7.259	.....
1,020.....	2.638	.....	50.51	.....	.....	.....
1,049.....	.....	1.1988	.....	31.69	.....	7.185
1,050.....	.....	0.9824	.....	35.68	.....	7.189
1,051.....	.....	0.9824	.....	40.59	.....	7.184
Average.....	2.768	1.0527	49.15	35.99	.....	.....

TESTS BY TENSION.

One end of each of the broken transverse specimens (see figs. 16 and 17) was formed into a tension specimen 0.798 in. in diameter and 6 in. in length between the heads. The tests were made in a testing machine (fig. 23) built by Messrs. Riehle Bros.

"The machine consists, as will be seen in fig. 23, of a bed-plate supporting an inverted hydraulic press, the plunger of which is firmly fastened to a cross-head on the bed-plate of the machine. To the cylinder of the ram, which is movable, is attached a yoke taking hold of the cross-head to which the specimens are secured. The hand force-pump which supplies the press with oil is fastened to the column near the end at which the weights are added. The figure representing the load is read from a steelyard lever or beam, supported at its knife edges by a cross-beam, which is supported in turn by two cast-iron columns.

"The upper end of the specimen is held by a cross-piece having a beveled hole cut in it to grip the specimen. This cross-piece is supported on knife-edges in the beam and by a system of links. The specimen being secured in the machine, the pressure is applied at the pump and transmitted to the press plunger, which being held at the top, the cylinder is forced downwards, carrying the lower end of the test-piece, which latter receives and transmits the stress thus produced.

"The extensions, like the deflections, were carefully taken with a micrometer-screw fastened to the upper head of the specimen, and which, when in contact, bears on an insulated rod attached to the lower head. The electrical contact apparatus previously described was used, readings of extensions being obtained to the thousand of an inch.

In the accompanying tensile record sheet the columns, headed "Stresses, Proofs," give the successively applied loads, up to that which actually broke the specimen, the amount of which breaking load will be found recorded in the column headed "Ultimate." These actual loads are used for the deduction of loads per square inch or original section, which are entered in the columns of the record sheets headed respectively "Proof load per square inch area of Original Section, P " and "Breaking Load per square inch Original Section, T ."

"In the column headed 'Extension, Actual,' the observed elongations, in inches, are recorded opposite the loads by which they were produced, and from these extensions, for the purpose of facilitating comparison, have been calculated the amounts of stretch in percentages of length which are entered in the column headed 'Percentage of length; per cent.'

"The modulus of elasticity, as per the definition already

given, is obtained by dividing any load per square inch of section within the elastic limit $\left(\frac{P}{K}\right)$ by the elongation per inch

$$\text{of length } \left(\frac{\lambda}{L}\right)$$

$$\frac{P}{K} \div \frac{\lambda}{L} = \frac{P \cdot L}{K \cdot \lambda}$$

where

P = any load within the elastic limit.
 L = length of specimen, in inches.
 K = section of specimen, in square inches.
 λ = elongation, in inches, produced by the load P .

"In the column headed 'Resilience, W ,' are recorded the number of foot-pounds exerted in straining the test-specimen to its elastic limit and to its breaking point, respectively, which values, as previously stated, are measures of the shock-resisting power of the material.

"After every 2,000 pounds added, the test piece was relieved of all load and the amount of permanent set measured.

"The results of the tests by tension have been plotted, fig. 24, and a curve drawn through the mean of the observations. The ordinates represent loads per square inch of section and the abscissas the extensions in per cent. of length. The sets have also been plotted and are shown in the same sheet.

"The tests by tension, like those made by transverse stress, indicate the remarkable uniformity in the mechanical properties of these two qualities of iron; and this is also well exhibited by the following table, which gives the ultimate strength per square inch, and the limits of elasticity, with their corresponding extensions for each of the six bars tested:

TESTS IN TENSION.

Laboratory Number.	Proof or Elastic Limit.		Extensions at Elastic Limit.		Breaking Load.		Total Extensions.	
	Pounds per sq. in.		Per cent.		Pounds per sq. in.		Per cent.	
	No. 4.	No. 2.	No. 4.	No. 2.	No. 4.	No. 2.	No. 4.	No. 2.
1,018.....	12,000	.....	0.0691	.....	34,000	.....	0.3825	.....
1,019.....	12,000	.....	0.0591	.....	34,815	.....	0.5635	.....
1,049.....	.....	7,000	0.085	.....	20,400	.....	0.5815	.....
1,050.....	.....	7,000	0.0875	.....	19,800	.....	0.5525	.....
1,051.....	.....	8,000	0.075	.....	20,000	.....	0.5580	.....
Average.....	12,000	7,388	0.0641	0.0736	34,407	20,800	0.5725	0.5473

"Owing to an error which was detected in the records of the extensions of No. 1,020 (No. 4 iron) it was considered unsafe to introduce the probable results, and they are consequently withheld. The bar behaved in all respects like No. 1,019.

"In a similar manner the following table indicates their:

MODULI OF ELASTICITY.

Laboratory Number.	No. 4.	No. 2.
1,018.....	15,825,397	.....
1,019.....	16,111,111	.....
1,049.....	.....	8,849,387
1,050.....	.....	13,735,108
1,051.....	.....	11,709,602
Average.....	15,968,254	11,450,754

"Values of elastic and ultimate resilience, as calculated from tests by tension, are given in the following table:

RESILIENCE.

Laboratory Number.	Elastic Resilience.		Ultimate Resilience.	
	No. 4.	No. 2.	No. 4.	No. 2.
1,018.....	1.04	.....	19.54	.....
1,019.....	0.89	.....	21.01	.....
1,049.....	.....	0.68	.....	14.86
1,050.....	.....	0.46	.....	17.98
1,051.....	.....	0.825	.....	19.26
Average.....	0.965	0.573	.....	17.38

TESTS BY COMPRESSION.

"The compression specimens were accurately turned cylinders, each of which was 2 in. in length and $\frac{1}{4}$ in. in diameter. They were prepared from one of the pieces taken from each bar after having been tested by transverse stress. (See figs. 16 and 17).

"The tests were made in the Riehle Bros. machine, above described, to which an attachment had been fitted for this purpose by the Mechanical Laboratory.

"The changes of length were determined in the same manner as were extensions in the tension tests, using the same micrometer screw and electrical contact apparatus. The results entered in the columns of the record sheets* will be understood from the explanation already given of the headings of the columns of the tensile record sheets.

"In every instance the specimen broke by combined bending and crushing—bending slightly before finally rupturing, forcing out a wedge-shaped piece.

"Curves have been plotted, fig. 25, representing the tests made by compression, the ordinates and abscissas having the same relative values as those of the plotted tension curve.

"The value of the ultimate compressive stress and that at the elastic limit with the corresponding amounts of compression of the specimens of both No. 2 and No. 4 irons are as follows:

RESISTANCE TO COMPRESSION.

Laboratory Number.	Compressive Stress at Elastic Limit.		Compression at Elastic Limit.		Ultimate Compressive Stress.		Total Compression.	
	Pounds per sq. inch.		Per cent.		Pounds per sq. inch.		Per cent.	
	No. 4.	No. 2.	No. 4.	No. 2.	No. 4.	No. 2.	No. 4.	No. 2.
1,018.....	61,115	.....	0.75	.....	127,323	.....	9.50	.....
1,019.....	50,930	.....	0.128	.....	127,323	.....	9.95	.....
1,049.....	.....	50,930	.....	1.09	91,674	.....	5.86	.....
1,050.....	.....	45,837	.....	0.898	80,137	.....	8.73	.....
1,051.....	.....	45,837	.....	1.06	81,488	.....	9.475	.....
Average.....	56,022	47,735	0.187	1.015	127,323	87,439	9.72	8.02

"The figures representing the elastic and ultimate resilience, as obtained by calculation from the tests by compression, are as follows:

RESILIENCE.

Laboratory Number.	Elastic Resilience.		Ultimate Resilience.	
	No. 4.	No. 2.	No. 4.	No. 2.
1,018.....	2.85	.....	302.16	.....
1,019.....	1.04	.....	343.	.....
1,049.....	.....	9.08	.....	218.54
1,050.....	.....	6.67	.....	147.81
1,051.....	.....	7.95	.....	136.875
Average.....	1.79	7.90	322.55	163.075

The results of the tests by torsion will be given next week.

* These are omitted on account of the space they would occupy, but a condensation is given in the table which follows.

THE SCRAP HEAP.

Railroad Manufactures.

The Wason Manufacturing Co., at Springfield, Mass., recently received an order for 100 freight cars for the Panama Railroad. The company has work enough on hand to keep its shops busy through the winter.

Contracts for the superstructure, columns and girders of the New York Elevated Railroad have been let, one mile to the Keystone Bridge Co., of Pittsburgh; one mile to the Phoenix Iron Co., at Phoenixville, Pa., and one mile to the Edgemoor Iron Co., of Wilmington, Del.

The Rogers Locomotive Works, at Paterson, N. J., recently shipped an engine to the Nantuxuck Railroad.

Valentine & Co., of New York, are now making regular shipments of their varnishes to Germany, France, England and Australia, in execution of positive orders. Their varnishes were especially commended by several of the foreign judges at the Centennial.

The Cincinnati Bridge Co., as lately noted, has made an assignment for the benefit of its creditors. The assignee reports that there will not be much more realized from the sale of assets than will pay the preferred claims. These claims are chiefly for labor and must by law be paid in full if the amount of the claim does not exceed \$100.

The new Vilas Iron Furnace, near Shawnee, O., in the Hooking Valley region, went into blast recently and is now making 20 tons per day of very fine quality of pig iron.

The Grant Locomotive Works, at Paterson, N. J., is making a large number of bed-plate or foundation castings for the New York Elevated Railroad.

Work has been begun on the removal of the Danville Iron Works from Danville, Pa., to Pueblo, Col. The works have made iron rails from 16 to 36 lbs. to the yard.

The Union Forge & Iron Works, at Pittsburgh, are running single turn and employing about 450 men. These works make hammered and rolled axles, truck irons, draw-bars, Miller coupling-hooks, links and pins, and car forgings generally, besides bar and shape irons.

J. G. Brill & Co., at Philadelphia, have recently shipped a two-horse street car to Berlin, Prussia, and two one-horse cars to Milan, Italy. These cars are sent as samples of their work, with the understanding that further orders are to be expected, if these cars are satisfactory. They are also building 20 one-horse cars for the Dry Dock, East Broadway & Battery road in New York; the entire equipment of a horse railroad in Fort-au-Prince, Hayti, and six narrow gauge cars for a steam railroad in Cuba.

Porter, Bell & Co., at Pittsburgh, recently delivered some narrow-gauge locomotives to the Waynesburg & Washington road. The Crescent Steel Works, at Pittsburgh, are running partly double turn, with 250 men.

The Alice Furnace, at Ironton, O., is making 20 tons of iron a day from a mixture of Hanging Rock and Iron Mountain ores.

The rolling mill of the Massillon (O.) Coal & Iron Co. has been leased by Charles Durant and J. Ostrander, of Cuyahoga Falls, who are making arrangements to start it up shortly. They have a new process for making wrought iron pipe, hollow stay-bolts for locomotives, and similar work.

The Lowmoor Iron Co. has bought some large tracts of iron land adjoining their own property in West Virginia. A new furnace is to be built on the property shortly.

The Glasgow Iron Works, near Pottstown, Pa., have resumed work.

The St. Albans (Vt.) Iron & Steel Co. has nearly completed its arrangements for the manufacture of steel rails.

The Wrought Iron Bridge Co., at Canton, O., has a contract for an iron highway bridge, 230 feet span, over the Genesee River, near Fowlersville, N. Y.

The Erie (Pa.) Car Works are building some cars for the one-rail road now in progress in the Bradford oil region.

The Baldwin Locomotive Works, Philadelphia, have recently shipped two engines to the Denver & Rio Grande and one to the Atchison, Topeka & Santa Fe. They are now shipping four locomotives to Rio de Janeiro, Brazil, three to Cuba, and three to Queensland, Australia. They have lately shipped two steam street cars to San Francisco and one to Dubuque, Ia.

The Akron (O.) Forge Co. is running its works with a good force, chiefly on car axles.

The Gap Furnace, near Hollidaysburg, Pa., has been rebuilt and improved and has just gone into blast. It is expected to make 100 tons of pig iron per week. It is owned by the Hollidaysburg & Gap Iron Co.

The new blooming mill of the Cambria Iron Works at Johnstown, Pa., is nearly finished.

The Philadelphia & Reading car shops, at Reading, Pa., are crowded with work, and many of the men are working 12 hours a day.

Tyrone Forge, near Tyrone, Pa., has resumed work on orders which will keep it busy nearly all winter.

The car shops of Osgood Bradley, at Worcester, Mass., started up Nov. 26. They have an order from the Boston & Lowell road for two smoking and baggage and 50 gravel cars, and another from the National Tube Works Co. for 25 iron flat cars, which are to be used on the Providence & Worcester road.

Quick Work in a Rail Mill.

The Bulletin of the American Iron & Steel Association says: "The Pennsylvania Steel Co., whose works are near Harrisburg, Pa., have handed us the following report of their work for the week ending Nov. 10, 1877: Number of Bessemer steel rails rolled, 5,688, weighing 1,617 tons of 2,240 lbs. Best day's work, 1,044 rails, weighing 302 tons of 2,240 lbs. Best half-day's work (Saturday), 558 rails, weighing 161 tons of 2,240 lbs. Average day's work, 1,034 rails, weighing 294 tons of 2,240 lbs. The rails rolled weighed 63 lbs. per yard.

"This is the heaviest week's work in rail-rolling in this country that has thus far been reported. In one week in April, 1877, the Lackawanna Coal & Iron Co. rolled 6,173 fifty-pound rails, weighing 1,377.18 tons of 2,240 lbs., at their works at Scranton, Pa.; and in one week in March, 1877, the Edgar Thomson Steel Co. rolled 5,900 rails, from 52.6 to 60 lbs. per yard, weighing 1,539.44 tons, at their works near Pittsburgh. European mills do no such work as this."

An Absent-Minded Conductor.

On the New York & Harlem road there is a conductor who seems to have a singular propensity for leaving his train when it is in motion. About a year ago he was badly hurt by walking out of the open door of a baggage car after his hat, which had blown off. One day last week he was taking up tickets while his train was passing through the Fourth Avenue tunnel in New York. After passing through the rear car he went on, thinking there was another car, and deliberately walked off the rear platform and fell on the track. He was soon missed, the train was stopped and help sent back, when he was found lying on the track, insensible and badly bruised, but with no bones broken.

Rapid Erection of a Bridge.

The Cleveland Herald, of Nov. 24, says: "Mr. George Reed, Superintendent of Bridges on the Lake Shore road, has just completed the construction of an iron bridge at Elmore, in Ottawa County. The work of putting up the bridge, which is composed of two iron spans, each 105 feet, weighing each 60 tons, was completed in just seven days after the iron was delivered. While the work was being done the old bridge had to be kept in position, as trains were passing at all hours. The last connection for the new bridge was made Wednesday evening, and trains allowed to run on it. The trestle work will be taken down at once."

* Wood's "Resistance of Materials," p. 113.

† Wood's "Resistance of Materials," p. 107.

‡ This sheet, owing to the great amount of space it would occupy, is omitted here. An abstract of the records is however given in the following table.



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CONDUCTED BY

S. WRIGHT DUNNING AND M. N. FORNEY.

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Editorial Announcements.

Passes.—All persons connected with this paper are forbidden to ask for passes under any circumstances, and we will be thankful to have any act of the kind reported to this office.

Addresses.—Business letters should be addressed and drafts made payable to THE RAILROAD GAZETTE. Communications for the attention of the Editors should be addressed EDITOR RAILROAD GAZETTE.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

Contributions.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies, the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

OCTOBER EARNINGS.

The reports of October earnings contained in our table this week for thirty different railroads, having in the aggregate about 19 per cent. of the railroads in operation in the country, show but a slight improvement over the earnings of the corresponding month in 1876. There is an increase, however, amounting on the average to 3.7 per cent. in the earnings per mile, and it is the more satisfactory because last year the very cream of the Centennial passenger traffic came in October, and also the few weeks of heavy grain traffic of the entire fall. For the grain movement was active for a short time last fall, in spite of the bad harvest. This year the movement has been heavy from the second week in August down to this time; last year it was light except for three or four weeks, but those three or four weeks were chiefly in October. It is, however, easy to exaggerate the effect of the Centennial on earnings last year. It was very great on a few roads, considerable on several roads, and something on most roads in September, October and most of November, but the roads most affected are not among those which report.

Of the thirty roads whose earnings for October are given in our table, 21 show an increase, not only in total earnings but in earnings per mile, the latter having grown from \$635 to \$659. Some of the increases are very large indeed—as 80½ per cent., 61, 44½, 23½, 21, 20, and 19½; and there are no decreases which are so considerable, though two important roads by reductions of 10½ and 16 per cent. make up a large total of decreases. The roads showing reduced earnings are pretty well scattered—one on the Pacific coast, one into Chicago from the southwest, two into St. Louis, two lines crossing Illinois south of Chicago, and two roads south of the Ohio. The nearest approach to trunk lines in the table are the Philadelphia & Erie and the Michigan Central. The former probably as much as any trunk line, and more than most, is supported by through traffic. It shows an increase of 16½ per cent., and this though it had a large Centennial traffic last year. The Michigan Central, which is much more of a passenger road, but has a large local as well as through traffic, shows an increase of 3½ per cent.

In order to facilitate a comparison of the earnings this October with those of several years previous, we have compiled the following table, in which earnings per mile of road are given for three years past for 22 roads, for four years past for 13 of them, and for five years for 12 of them. This will enable us to see whether this year's earnings were

extraordinary or only notable when compared with last year:

October Earnings Per Mile of Road.

	1877.	1876.	1875.	1874.	1873.
Atchison, Topeka & Santa Fe.....	\$459	\$401	\$370	.....	.....
Burlington, Cedar Rapids & Northern	405	303	389	\$336	\$313
Cairo & St. Louis.....	165	209	204	.....	.....
Central Pacific.....	933	1,157	1,229	1,163	1,129
Chicago & Alton.....	659	820	782	.....	.....
Chicago, Milwaukee & St. Paul.....	844	584	696	.....	.....
Denver & Rio Grande.....	277	223	242	302	286
Indianapolis, Bloomington & West'n	346	404	400	437	444
International & Great Northern.....	351	305	340	322	214
Kansas Pacific.....	595	513	469	471	584
Michigan Central.....	533	806	836	926	860
Missouri, Kansas & Texas.....	419	427	388	399	472
Mobile & Ohio.....	440	502	417	.....	.....
Nashville, Chattanooga & St. Louis.	494	421	457	.....	.....
New Jersey Midland.....	848	816	619	.....	.....
Paduach & Memphis.....	150	184	172	.....	.....
St. Louis, Alton & Terre Haute.....	1,365	1,171	1,167	.....	.....
Bellefonte Line.....	809	718	808	927	785
St. Louis, Iron Mountain & South'n.	748	639	567	522	358
St. Louis, Kansas City & Northern.....	565	620	522	552	.....
St. Louis & Southeastern.....	322	317	300	378	351
Toledo, Peoria & Warsaw.....	485	582	537	396	498

Ten of these roads show larger earnings for last October than for any other reported, and five show smaller earnings than ever before. Fifteen earned more in October, 1877, than in October, 1875. Of the twelve which are reported for 1873, nine show smaller and three larger earnings this year than then, when, by the way, earnings, especially in the Northwest, were large, in spite of the panic.

In considering the earnings in different years, it must be remembered that expenses have been greatly reduced of late years. This has not prevented the proportion of expenses from being as large as before when competition has brought about great reductions of rates, which has been the case nearly every year until now. This fall, doubtless, taking the railroads as a whole, the average rates are higher than last year—on many roads much higher. Thus with only equal gross earnings, there is now doubtless a considerable increase in profits.

For the ten months ending with October our table also has returns from 30 railroads, 28 of which are in the list for October. These thirty railroads have about 20 per cent. of the mileage of the country and 4.4 per cent. more than last year. Their aggregate earnings were 2.2 per cent. less in 1877 than in 1876, and their earnings per mile fell from \$5,206 to \$4,890, or 6.3 per cent. Of the whole number 14 show a decrease in total earnings, and 15 in earnings per mile. The heaviest decreases are 8.6 per cent. on the Central Pacific (29 per cent. in earnings per mile), which alone is equal to three-fourths of the aggregate decrease; 23.6 on the Toledo, Peoria & Warsaw; 17.7 on the Indianapolis, Bloomington & Western; and 14.7 on the Chicago & Alton. The only very large increases for the ten months are 16.2 per cent. on the International & Great Northern, and 15.6 on the St. Louis, Iron Mountain & Southern.

Our table for the nine months ending with September showed a decrease of 6.8 per cent. in average earnings per mile. This for the 10 months, therefore, shows an improvement—a reduction in the unfavorable balance.

Nothing new can be said as to the future prospects. Traffic is quite generally light just now, as it usually is at this season. In spite of the great amount of grain forwarded during the fall, the stocks at the seaboard are not large as navigation closes. That there is a great stock of grain in the Northwest to come forward is beyond doubt; whether it will be marketed rapidly in the winter without an advance in prices remains to be seen. The probabilities are that a good part of it must be had in Europe before spring, and if so we may expect heavy winter shipments by Christmas. The traffic in hogs and provisions is likely to be as heavy as in almost any previous year as soon as freezing weather sets in; the cotton, which was a late crop, has now begun to come forward pretty freely, and as there is supposed to be nearly as large a crop as last year, we should expect more than the average movement of this staple for the rest of the season. Petroleum continues to be marketed in enormous quantities and at higher rates than before for many months. Indeed, there is hardly any great staple of production which is wanting to make up a full traffic, and several are more plentiful than usual, some more so than ever before. Railroad business, however, is not all made up of great staples. A general activity in trade and manufactures adds greatly to traffic and still more to earnings. An abundant production of the great staples of grain, provisions, cotton, coal and petroleum, with good markets for them, is favorable to the resumption of such activity, but it does not create it at once and alone. In some directions there are signs of renewed activity in manufacturing. The demand for iron has been a little better, and a few more blast furnaces are preparing to blow in. Altogether, though business is by no means active, there are fewer signs of stagnation than at this time last year, or this year before harvest. Though the movement is very slow, it seems to be in the right direction, which gives us reason to hope that we have passed the lowest point of depression. The railroads are particularly fortunate now by reason of the absence of any serious quarrels concerning important traffic. If they can get business now they can make profits, which often has not been the case. With current rates and a fair traffic only (and rates will probably be somewhat higher and traffic

decidedly large), the roads between the sea-board and the Northwest should be able to earn net more this winter than in any other since 1873-74. They have now the field substantially to themselves. Probably no shipments of grain will be made either by lake or canal after this date, though there will be arrivals for a week or more to come. Generally the roads seem in good condition for the winter, ready to take all that may be offered at remunerative rates, but, contrary to their disposition sometimes, not at all anxious to do business that will not pay.

THE ERIE REPORT.

The report for the year ending with September, 1877, of which we give a summary with some deductions on another page, is that made to the State Engineer and Surveyor of New York, in compliance with the State law. The company makes also another report addressed to its stockholders, which is much fuller in details of expenses, and otherwise. We understand that this report, which is especially intended to give those interested in the company the information they desire concerning the condition and operations of their property, will appear very soon, and on this account we have omitted any detailed statement of the expenses and finances of the company, and also some discussion which is suggested by the figures in the State report, but may become superfluous when the company report appears with its fuller figures and the explanations of the officers. The State report is a report of figures solely, and it is only by some departures from its forms that some features in the report which we publish to-day are made plain.

This road last year, as for so many before, has had to accept and carry the traffic of a great trunk line, with the requirements and the rates of such lines, while lacking many of the facilities which its competitors possess, and without any means to provide itself with such facilities. The managers of the road have had to do what they could, not what they would. It would be absurd to compare the results which they produce on a road which has only a single track for a large part of its main line, is still largely of iron, which continued to make renewals with re-rolled iron long after roads with credit had discarded them for all tracks with heavy traffic, whose motive power is largely antiquated in design and nearing the days when it must go into the scrap heap—it would be absurd to compare the results produced on this imperfect railroad with those of lines which have been put and kept in the most efficient condition that their managers can imagine. In importance and bulk of traffic the Erie can be compared with other trunk lines, but as a machine for carrying traffic it is in many respects *sui generis*.

It by no means follows that if the road had been provided throughout with all that its best furnished rivals have, it would be more profitable than it now is. Doubtless it could carry its traffic at a much lower cost per unit of traffic, but whether the saving in working expenses would equal the interest on the cost of quadruple tracks, etc., is a question. There can be no question, however, that the working expenses are actually largely increased by the imperfections of the road and its equipment, and that a considerable amount of capital expended in improvements would be a very profitable investment. Just now it is not so important to increase the capacity of the road as to fit it to carry cheaply the existing traffic. There is no prospect of any very large increase of business soon, however much the capacity of the road may be increased. But such additions to the tracks as will prevent delays, and make it possible to keep the rolling stock moving, and the substitution of heavy engines which can take long trains over the road for the old light ones which carry half as many cars at an almost equal expense per train-mile, the renewal of the tracks with material which will at once reduce largely the expenditures for maintenance and make larger trainloads possible—these and similar improvements which will reduce working expenses much more than the interest on their cost are pressing requirements of the road, and the lack of them is extremely disheartening to those who work it, as they, being in charge of a "great railroad," are quite generally expected to do as well as anyone else does on any road. They are, in short, expected to do the best work with inferior tools.

The Erie Railway during the year covered by the report kept up its traffic remarkably. Both passenger and freight traffic were larger than ever before. We are somewhat surprised at this showing, for though the year covered perhaps the two best months of Centennial traffic, for the ten months following passenger business was generally dull, and the Baltimore & Ohio in its report for the same twelve months explains the falling-off in its passenger earnings by the smaller Centennial traffic. As to freight, the coal business was not larger, and the grain business was smaller, and the very much larger petroleum traffic we would not expect to balance the loss in grain. Actually, however, the passenger traffic (number of passengers carried one mile) was 4.8 per cent. greater, and the freight traffic (number of tons carried one mile) 7.1 per cent. greater in 1876-77 than in 1875-76. This is a material increase in

business. So far as freight is concerned, however, it is well to remember that this road has not before shared in the great increase of trunk-line traffic which has accompanied the great decrease in average rates since 1873. In the last named year it carried just about as much as in any of the three following, while on the New York Central & Hudson River in the same three years the freight traffic increased 34 per cent. As the Baltimore & Ohio does not report its freight traffic, except some of the items of its deliveries at Baltimore, we cannot make any comparison of the Erie's traffic last year with that of other trunk lines. We shall be surprised, however, if generally any increase is shown for the same year, as the traffic of 1876 was extraordinarily and artificially large on the trunk lines, made so by unprofitably low rates.

So far as the Erie is concerned, however, its rates were reduced more from 1876 to 1877 than from 1875 to 1876, as our summary of the report shows. There was a decrease of 10 per cent. in the average passenger rate and of 14 per cent. in the average freight rate from 1876 to 1877, while for the previous year these decreases had been but 5 and 5 per cent.

Taking the traffic altogether, and counting a passenger mile equivalent to two ton miles, which is very near the truth so far as receipt and cost are concerned, the Erie Railway had 6.6 per cent. more business in 1876-77 than during the preceding year.

In spite of this, however, the expenses were reduced to a surprising degree—nearly 11 per cent. on what is called the business of the railroad proper—that is excluding such appendages as the Pavana ferry, the horse railroad in Jersey City, the Grand Opera House, the baggage express, etc., which last year netted a considerable loss. But if we include these as indispensable parts of the Erie property, as the ferry certainly is, the decrease in expenses was 9 per cent. It would be interesting to ascertain just where this great saving was made, and the report gives the expenses in detail: but as the coming report is likely to give them more in detail, with some remarks, we omit any further examination than one which shows that more than half of the whole amount of saving is in maintenance of equipment, and one fourth in maintenance of road and real estate. The reduction in maintenance of equipment is 25.6 per cent. compared with the previous year, and though the report shows that the stock was not quite maintained—two locomotives and several cars disappearing within the year—on the other hand the locomotive stock is reported to be in a greatly improved condition.

What we have already said of the reduction in the average rates received has made it plain that the larger traffic must have resulted in smaller earnings. The reduction is 6 per cent. in passenger, 6.8 in freight and 7.2 per cent. in total earnings from the railroad, and to 6.7 per cent. in the receipts from all sources, including some interest on securities. These reductions, taken together, just about equalled in amount the reduction in expenses, so that the net earnings remained about the same—larger by 0.6 per cent.

These net earnings amounted to about \$3,900,000, which is certainly a very small sum to pay interest on \$140,000,000 of stock and bonds, which is something less than the absurd amount of the Erie's outstanding securities. When we neglect these figures, however, and consider only the property which they are supposed to represent, the result is not so unsatisfactory. We must remember not only that the Erie Railway is not a perfectly constructed and equipped road, but that of the 957 miles worked only 526 are owned by the company. The net earnings per mile for the entire system were last year \$3,960, which is equivalent to 7 per cent. on \$56,600. Per mile of track the net earnings were \$2,134, which is more than is earned by many companies which pay 8 or 10 per cent. dividends and never dream of failing to pay interest on their bonds. One of the troubles of the Erie, doubtless, is its imperfection; another, the lack of stability in its management; a third and greater one, the inheritance of the consequences of the practices of dishonest managers; but by far the greatest of all is its capital account of \$270,000 per mile of road and \$130,000 per mile of track. If its proprietors expect to get interest on the whole of this amount, they are doomed to perpetual and deserved disappointment. What is wanted is some more money and a great deal less water in the capital account.

The Deterioration of Railroad Cars.

Last week we published a report of a meeting of railroad men held at the rooms of the Master Car-Builders' Association on Thursday, Nov. 15, when this subject was discussed. Some idea of its importance may be formed if it is remembered that the accounts between different railroads, in the adjustment of which this question is involved, amount to many thousands of dollars annually. The practical way in which it presents itself is this: if in passing over one line the cars belonging to another line are destroyed, the company owning the first line is obliged to pay the owners of the cars destroyed for them. But the question then arises, how much should be paid; or in other words, how much are old cars worth, or at what rate do they deteriorate by use. If a car when new is worth \$550 how much is it worth when it has run one, two, three or more years? In order to illustrate in the simplest way what are the elements of the cost

of car service, we will assume, for the sake of having figures which will divide evenly into each other and thus make the calculations more simple, that the life of a car will be twelve years, its cost \$550, and the life and cost of the other parts to be as follows:

	Value when new.	Value when worn out.	Amount of Depreciat'n.	Time of service or life.*
Wheels.....	\$100	\$40	\$60	4 years.
Axles.....	50	18	32	6 "
Journal bearings.....	14	5	9	3 "
Truck springs.....	40	5	35	6 "
Truck frames.....	45	15	30	12 "
Draw-bars.....	40	10	30	6 "
Castings.....	20	5	15	12 "
Car body.....	160	20	140	12 "
Roof.....	60	10	50	12 "
Painting.....	21	0	21	6 "
Total.....	\$550	\$128	\$422	

Now let us see what the service of such a car would cost at the end of each year.

At the end of the first year it would evidently be as follows:

First cost of car.....\$550 00
Interest, at 7 per cent per year.....38 50

\$588 50

But suppose that the car was then worn out, according to our hypothetical table above, the old material would be worth \$128, so that the actual net cost of the service for that year would be \$588.50 — \$128 = \$460.50, which would be the cost of one year's service if the car was worn out or destroyed at the end of that time, as cars sometimes are by accidents. At the end of each succeeding year it would be as follows:

Cost at end of first year.....\$588 50
Interest on this amount for year.....41 19

Gross cost of car at end of second year.....\$629 69
Less value of old material.....128 00

Net cost at end of second year.....\$501 69

Gross cost brought down.....\$629 69
Interest on this amount for year.....44 08

Gross cost of car at end of third year.....\$673 77
Less value of old material.....128 00

Net cost at end of third year.....\$545 77

Gross cost brought down.....\$673 77
Net cost of new journal-bearings.....9 00

Interest for year.....47 79

Gross cost of car at end of fourth year.....\$730 56
Less value of old material.....128 00

Net cost per year at end of fourth year.....\$602 56

Gross cost brought down.....\$730 56
Net cost of new wheels.....60 00

Interest for year.....55 34

Gross cost of car at end of fifth year.....\$845 90
Less value of old material.....128 00

Net cost at end of fifth year.....\$717 90

Gross cost brought down.....\$845 90
Interest for year.....59 21

Gross cost of car at end of sixth year.....\$905 11
Less value of old material.....128 00

Net cost at end of sixth year.....\$777 11

Gross cost brought down.....\$905 11
Net cost new axles.....32 00

" " journal bearings.....9 00

" " truck springs.....35 00

" " draw-bars.....30 00

" " painting.....21 00

Interest for year.....\$1,032 11

Gross cost of car at end of seventh year.....\$1,104 35
Less value of old material.....128 00

Net cost at end of seventh year.....\$976 35

Gross cost brought down.....\$1,104 35
Interest for year.....77 30

Gross cost of car at end of eighth year.....\$1,181 65
Less value of old material.....128 00

Net cost at end of eighth year.....\$1,053 65

Gross cost brought down.....\$1,181 65
Net cost of new wheels.....60 00

Interest for year.....86 91

Gross cost of car at end of ninth year.....\$1,268 56
Less value of old material.....128 00

Net cost at end of ninth year.....\$1,140 56

Gross cost brought down.....\$1,268 56
Net cost of new journal bearings.....9 00

Interest for year.....93 63

Gross cost of car at end of tenth year.....\$1,431 19
Less value of old material.....128 00

Net cost at end of tenth year.....\$1,303 19

Gross cost brought down.....\$1,431 19
Interest for year.....100 18

Gross cost of car at end of eleventh year.....\$1,531 37
Less value of old material.....128 00

Net cost at end of eleventh year.....\$1,403 37

Gross cost brought down.....\$1,531 37
Interest for year.....100 18

Gross cost of car at end of twelfth year.....\$1,631 55
Less value of old material.....128 00

Net cost at end of twelfth year.....\$1,503 55

From this calculation it will be seen that at the end of the twelfth year the total cost of service would be \$1,503.55. At first sight it would therefore seem as though the cost per year of the service which the car rendered was one-twelfth of this sum, or \$125.29, and, therefore, if the car was destroyed at the end of a year, say, it would then have rendered one year's service, so that the loss to the company would be the difference between the value of this service, plus the value of the old

* The life or endurance in this table is merely hypothetical, and differs from the figures given by Mr. Garey at the meeting referred to. As they are used only for purposes of illustration, this is of no importance.

material (—\$125.29+\$128=\$253.29) and the cost of the car at the end of that time, or \$588.50—253.29=\$335.21. At the end of the second year the value of the service would be twice \$125.29, or \$250.58, so that the car would then be worth what it cost, less the value of its service and the old material, or \$629.69—(\$250.58+\$128)—\$251.11. In the following table this method of calculation has been carried out for the full period of the assumed life of the car:

End of	Cost of car less value of the old material.	Value of service.	Value of car at that time.
1st year.....	\$460 50	\$125 29	\$335 21
2d ".....	501 69	250 58	251 11
3d ".....	545 77	375 87	169 90
4th ".....	602 56	501 16	101 40
5th ".....	717 90	626 45	91 45
6th ".....	777 11	751 74	25 37
7th ".....	907 35	877 03	30 32
8th ".....	1,033 65	1,002 32	51 33
9th ".....	1,200 56	1,127 61	72 95
10th ".....	1,303 19	1,252 90	50 29
11th ".....	1,403 37	1,378 19	25 18
12th ".....	1,503 55	1,503 55	

A casual examination of this table will lead any one to suspect the correctness of the results. That a car which is capable of rendering twelve years' service should at middle age, or after it had run only six years, be worth only \$25.37 would be very surprising.

The error is that no interest is allowed on the earnings of the car. Thus, suppose its earnings to be worth what the service costs, or an amount which in twelve years would be equal to \$1,503.55, or the cost of the car at that time. Now, it would not be necessary for the car to earn one-twelfth of this sum each year, because at the end of each year its earnings can be placed at interest, so that what the car must earn, so as to pay its own expenses, is an annual sum, which if placed at compound interest each year would, at the end of twelve years, amount to the cost of the car for that time. To do this, instead of earning \$125.29, it would only be required to earn about \$84 each year, because this sum annually placed at interest would in twelve years amount to \$1,503.55, or the cost of the car at that time. The following table has been calculated on this basis. The second column gives the cost of the car, less the value of the old material at the end of each year; the third column, the value of service of the car, with accrued interest at the same periods; the fourth column, the value of the car less the value of its service and old material; the fifth, the amount of depreciation of the value of the car from its first cost less the value of old material; the sixth column gives the percentage of depreciation at the end of each year:

End of	Cost of car, less value of old material.	Value of Service.	Value of car, less cost, less value of service and of old material.	Amount of depreciation from first cost, less the value of its old material.	Amount depreciation from first cost of car at \$550.
1st year.....	\$460 50	\$84 00	\$376 50	\$45 50	8.3 pr. ct.
2d ".....	501 69	173 88	327 81	94 19	17.1 "
3d ".....	545 77	270 05	275 72	146 28	26.6 "
4th ".....	602 56	372 95	229 61	192 39	35.0 "
5th ".....	717 90	483 06	234 84	187 16	34.0 "
6th ".....	777 11	600 87	176 24	245 76	44.7 "
7th ".....	970 35	726 93	243 42	172 58	31.3 "
8th ".....	1,033 65	861 52	191 83	230 17	41.8 "
9th ".....	1,200 56	1,006 14	194 42	227 58	41.4 "
10th ".....	1,303 19	1,160 56	142 63	279 37	50.8 "
11th ".....	1,403 37	1,325 79	77 58	344 42	62.6 "
12th ".....	1,503 55	1,503 55		422 00	76.7 "

In the last column it will be noted that the rate of depreciation is not regular. Thus at the end of the seventh year the car is represented as being worth more than at the end of the fourth year. This is due to the fact that at the beginning of the seventh year the car had new axles, journal-bearings, springs, draw-bars and painting, amounting in all to \$127, and therefore its condition was really improved at the end of that year over what it was previously. But with a large number of cars the average expenditures per car for repairs of this kind would probably be nearly uniform from year to year. To determine the amount or rate of depreciation there are, therefore, two methods available; one is to keep an "individual" account with each car and charge it with all expenditures made for repairs, crediting all old material taken from it and service performed by it, and also charging interest on expenditures at the end of each year. If the value of the service performed could be determined, this method would give perfectly correct results, but the keeping of such accounts, where the cars owned by a company are numbered by thousands, would involve a large amount of work. This work, if the accounting was properly systematized, would, it is thought, be much less than is ordinarily supposed, and its cost, we believe, would be a profitable expenditure of money.

The other method of arriving at the rate of deterioration of cars would be by averages. The total amount of money expended for repairs, as given in our hypothetical statement—and we wish to impress upon readers that it is only hypothetical, and that the figures given cannot be relied upon—was for the total period of twelve years \$687, or \$57.25 per year. In practice this sum would vary considerably with different cars, but probably the average expense, of say a thousand, would be nearly the same each year. If now we could ascertain what this average annual expense is, and then add it each year to each car as the cost of maintenance, and also add interest, we should then get a close approximation to their average deterioration, provided also that we knew their average life. These are therefore the unknown quantities in the problem.

With those given, there would be no difficulty, by the method indicated above, in determining the rate of deterioration. The cost of repairs of different kinds of cars ought to be a matter of record on the books of many companies, and if any memorandum is kept of the time when they are put into service, and when they are destroyed, it would give the average life. These two items—the average annual cost per car and the life—are matters of fact and not of theory, and could only be determined

in actual practice. The difficulty will probably be that the cost of maintaining different classes of rolling stock is not kept separate from each other, and while the annual cost of maintaining box cars might be one sum, that for platform, coal or oil cars might be materially different. In investigating such questions, however, some advance is made if we do no more than learn exactly what it is that we do not know or the direction in which our inquiries should be made. The two unknown quantities might be stated algebraically thus:

X =Average annual cost of maintenance of cars.

Y =Average life of cars.

Who will supply us with values for these now unknown quantities?

The December Meeting of Railroad Men and "Others."

The next monthly meeting will be held at the rooms of the Master Car-Builders' Association at No. 113 Liberty street, New York, Thursday, Dec. 20, at 7 p. m. The subjects for consideration and discussion will be friction, lubrication and lubricants. Professor Thurston has promised to be present, and to talk about these subjects, and will illustrate his remarks with his oil-testing machine and other instruments.

We have been requested to announce that these meetings are not intended for one class of railroad men only, but they are designed to bring together all who are interested in the working of railroads, and, if possible, to induce them to take part in the discussions of the subjects which are brought up for consideration. An especial effort will be made this winter to induce the superintendents, purchasing agents, master mechanics, master car-builders and other railroad officers and employees to attend. The meetings are entirely free and are open to all, including the manufacturers of railroad material of all kinds. These meetings have—many of them—been of much interest, and are capable of being made still more so. The subject which will be brought up at the next one is of very great importance and has recently received more attention than ever before, and the manufacturers of lubricants, journal-bearings, etc., will doubtless have much useful information to communicate. If it were possible to get reliable statistics from a large number of roads concerning the number of hot boxes per thousand miles run, it would be information which needs to be known, and which would lead to a great deal of useful inquiry if it was made public. Persons at a distance who are unable to be present are requested to send any data of this kind, or any other useful information relating to this subject, by letter.

Record of New Railroad Construction.

This number of the *Railroad Gazette* contains information of the laying of track on new railroads as follows:

Foxburg, St. Petersburg & Clarion.—Extended from St. Petersburg, Pa., eastward to Turkey City, 5 miles. It is of 3 ft. gauge.

Union Railway, Transfer & Stock Yards.—This company's road, generally called the *Indianapolis Belt*, is extended from Brightwood, Ind., west to North Indianapolis, 4 miles.

Maple River.—Extended from Ida, Ia., southwest to Mapleton, 24 miles.

Central Branch, Union Pacific.—Extended from Greenleaf, Kan., west by south to Clifton, 20 miles.

This is a total of 63 miles of new railroad, making 1,945 miles completed in the United States in 1877, against 2,102 miles reported for the corresponding period in 1876, 1,150 in 1875, 1,686 in 1874, 3,355 in 1873, and 6,311 in 1872.

THE ERIE ELECTION passed off without any demonstration on the part of those opposed to the Receiver's management and to the plan of reorganization. There was perhaps no reason to expect anything of the kind, but the history of the Erie Company has been so marked by battles, sieges and *coups d'état* that people are led to expect the improbable, so to speak, in all that concerns it. The McHenry party, if it can be called party, consisting as it apparently does chiefly of James McHenry and those whom he employs—this party, represented in this country by General Sickles, would doubtless have been glad to prevent the election of the old board, or in any way make some movement to break up the reorganization scheme. The trouble with it was that it had no stock to speak of—not that there are no stockholders who are dissatisfied with the present management, for there are some influential ones—but these gentlemen generally are not ready to hand the road over to James McHenry; that, they think, would be like jumping out of the frying pan into the fire. Things have changed since it was easy to get the names of the best men in the country connected with the "rescue" of the Erie Railway by men who did not own it in opposition to those who did.

THE INSTITUTION OF CIVIL ENGINEERS offers premiums for communications of a complete and comprehensive character on a long list of subjects, among which are "The Differences in Design of British and Foreign Locomotive Engines, showing the benefits from increase in weight, and the relation that ought to exist between the diameter of the wheel and the load it has to carry;" "The Lighting of Railway Carriages;" "The Appliances and Methods used in Different Countries for Tunnel-Driving, Rock-Boring and Blasting;" "The Different Systems of Opening Bridges;" "The Design, Generally, of Iron Bridges;" "The Result of the Use of Steel in Mechanism, and in Works of Construction;" "The Application of Steam Machinery for Excavating;" "The Effects of the Lapse of Time on the Strength of Materials;" "The Causes of Slips in Rocks and Earths of Different Kinds;" "The Triangulation Survey and Mapping of Districts and Leveling of Countries."

THE CAR ACCOUNTANTS' ASSOCIATION—that is, the one organized about a year ago, of which Mr. Geo. W. Jones is Chairman and F. M. Luce Secretary, not the organization which met in Nashville last October and is to meet in Buffalo next Wednesday—gives notice that it will hold its next convention in New York, April 26, 1878, and extends an invitation to all railroads and fast freight lines to send representatives to that convention. The circular concerning the Buffalo meeting requests each road to send its "General Manager, Auditor or Car Accountant, with full power to act in the premises." The desire of those calling this meeting is to secure the general adoption on Northern roads of the system of reporting daily to the company owning it the position and mileage for the day of every foreign car, in order that each company may know where its cars are and what they are doing, as well when on connection lines as while on its own. This system was adopted at the Nashville meeting by most of the roads of 5 ft. gauge, which form a system by themselves so far as car interchange is concerned. It is very warmly advocated by some important companies in the North, but is also strongly opposed by a considerable number of car accountants, though the grounds of their opposition have not been very clearly explained so far.

NEW USES FOR IRON are to be sought by a commission appointed by the Belgian Government, consisting of twenty prominent civil and mining engineers, iron manufacturers, architects and railroad officers. The report of the Minister of Public Works, in accordance with which the commission was appointed, urges the investigation particularly as likely to increase the demand for the products of the Belgian iron works, which have long been suffering for want of sufficient orders. The Minister mentions that in his department already experiments have been made in renewals of wooden railroad ties by an iron substructure, with hopes of success, and he mentions as worthy of attention the substitution of iron for wood for frames, floor beams, cranes, scaffolding, etc., in building, for supports, etc., in mines, etc.

NEW PUBLICATIONS.

Tenth Annual Report of the American Railway Master Mechanics' Association.

Eleventh Annual Report of the Proceedings of the Master Car Builders' Association.

These two reports have reached us this year almost simultaneously. A large part of the first has already appeared in these pages, although a few of the reports of committees were not published in the *Railroad Gazette*, among them the report on engine and tender trucks, which is elaborately illustrated by engravings of the drawings accompanying the report. The volume is somewhat larger than the one of last year, having 248 pages this, compared with 184 last.

The volume of the Master Car Builders' Association, as most of our readers know, is of smaller size and more modest dimensions, although it also is larger this year than last, the present one having 164 pages and the last 120. We will reserve a more extended notice of these reports for a future occasion.

No. 32 of Van Nostrand's Science Series is *Cable Making for Suspension Bridges*, with special reference to the cables of the East River Bridge, by Wilhelm Hildenbrand, C. E. The little book contains a description of the manufacture of wire cables by the late John A. Roebling's method, and practiced by him and his son Washington A. Roebling, in the construction of many important bridges. It also has theoretical investigations concerning the regulation of cables.

The basis of the calculations is the practice in the work now in progress on the East River Bridge.

General Railroad News.

ELECTIONS AND APPOINTMENTS.

Boston & Providence.—At the annual meeting in Boston, Nov. 21, the following directors were chosen: Henry A. Whitney, Thomas P. I. Goddard, J. H. Walcott, Wm. R. Robeson, Francis M. Weld, Joseph W. Balch, Royal C. Taft. The only new director is Mr. Taft, who succeeds Mr. George W. Hallett, who declined a re-election, after serving 23 years as a director.

Buchanan & Clifton Forge.—At the annual meeting in Richmond, Va., Nov. 15, John W. Johnston was re-elected President, with the following directors: Edward Dillon, W. W. Gordon, B. H. Newlin, Thomas Seddon, A. Y. Stokes.

Charlotte Harbor & Northern Central.—At the annual meeting of this company (formerly the Gainesville, Ocala & Charlotte Harbor) in Gainesville, Fla., Nov. 16, the following directors were chosen: J. B. Brown, N. R. Gruelle, Gainesville, Fla.; Thos. C. Lanier, Leesburg, Fla.; B. F. Matthias, Paris, Ill.; H. A. Howard, George B. Plimney, Champaign, Ill.; H. C. Whitney, Chicago. The board elected H. A. Howard, President; B. F. Matthias, Vice-President; N. R. Gruelle, Secretary and Treasurer.

Chicago & Eastern Illinois.—Mr. Robert Forsyth has been appointed General Freight and Passenger Agent of this company, vice Adam Holliday resigned. All communications relative to the freight and passenger business should be addressed to Mr. Forsyth.

Connecticut Valley.—At the annual meeting in Hartford, Conn., Nov. 27, the old board was re-elected, as follows: James C. Walkley, N. Hollister, George Beach, T. B. Cooley, E. T. Smith, E. R. Wiggins, Hartford, Conn.; Samuel Babcock, Arthur W. Bacon, Middletown, Conn.; Luther Boardman, East Haddam, Conn.; Isaac Arnold, Haddam, Conn.; Oliver H. Clark, Chester, Conn.; S. M. Comstock, Essex, Conn.; John W. Marvin, Saybrook, Conn. The board re-elected Samuel Babcock President.

Corpus Christi, San Diego & Rio Grande.—At the annual meeting in Corpus Christi, Texas, Nov. 19, the following directors were chosen: A. M. Davis, J. S. McCampbell, D. Hirsch, P. Hoffman, P. Doddridge, M. Kennedy, W. W. Wright, U. Lott, Geo. French, Ed. Buckley, J. B. Mitchell, N. G. Collins, W. L. Rogers. The board elected U. Lott, President; W. L. Rogers, Vice President; J. B. Mitchell, Secretary; A. M. Davis, Treasurer.

Duxbury & Cohasset.—At the annual meeting in Boston, Nov. 20, the following directors were chosen: F. L. Ames, Royal W. Turner, Onslow Stearns, Uriel Crocker, Joseph O. Cole, Stephen M. Gifford, N. H. Whiting, George O. Brastow, Wm. T. Davis.

Erie.—At the annual meeting in New York, Nov. 27, there were 578,881 shares voted on, of which 548,902 were voted for the old board and 29,979 for various opposition candidates. The old board was re-elected as follows: John B. Brown, Portland, Me.; Solomon S. Guthrie, Buffalo, N. Y.; Giles W. Hotch-

kiss, Binghamton, N. Y.; Homer Ramsdell, Newburg, N. Y.; Thomas Dickson, Scranton, Pa.; Asa Packer, Manch Chunk, Pa.; Cortlandt Parker, Newark, N. J.; J. Lower Welsh, Philadelphia; Herman R. Baltzer, R. Suydam Grant, Hugh J. Jewett, John Taylor Johnston, Edwin D. Morgan, Marshall O. Roberts, Samuel Sloan, Henry G. Stebbins, George F. Tallman, New York.

Grafton Centre.—At the annual meeting in Grafton, Mass., last week, the following directors were chosen: J. D. Wheeler, W. Faulkner, G. K. Nichols, Silas Vinton, G. F. Slocumb, S. A. Forbush, F. Baldwin, J. A. Dodge, A. M. Bigelow, J. Wheelock. The board elected J. D. Wheeler President; A. A. Ballou, Clerk; H. F. Wing, Treasurer; W. Faulkner, Superintendent; Silas Vinton, Assistant Superintendent.

James River & Kanawha Canal.—At the annual meeting in Richmond, Va., Nov. 14, John W. Johnston was re-elected President, and John Ott and John J. Meredith directors on the part of the stockholders.

Monadnock.—At the annual meeting in Peterboro, N. H., Nov. 20, the old board was re-elected as follows: O. H. Bradley, H. A. Blood, John H. Fairbank, Henry French, Jonas Livingston, Willis Phelps, Peter Upton. The road is leased to the Boston, Barre & Gardner.

Naugatuck.—At the annual meeting in Bridgeport, Conn., Nov. 21, the old board was re-elected, as follows: E. F. Bishop, W. D. Bishop, R. Tomlinson, Bridgeport, Conn.; J. G. Wetmore, Winsted, Conn.; F. J. Kingsbury, Waterbury, Conn.; R. M. Bassett, Birmingham, Conn.; H. Bronson, J. B. Robertson, New Haven, Conn.; A. L. Dennis, Newark, N. J. The board re-elected E. F. Bishop, President; Horace Nichols, Secretary and Treasurer; George W. Beach, Superintendent.

New Haven & Derby.—At the annual meeting in New Haven, Conn., Nov. 21, the following directors were chosen: Isaac Anderson, Charles Atwater, H. S. Dawson, Charles L. English, J. A. Sperry, N. D. Sperry, M. F. Tyler, New Haven, Conn.; E. N. Shelton, G. W. Shelton, Birmingham, Conn.; J. H. Bartholomew, O. P. Cowles, F. Farrell, Thomas Wallace, Ansonia, Conn. Messrs. Cowles and E. N. Shelton are new directors, replacing Thomas L. Cornell and Thomas Elmes.

Northeastern, of South Carolina.—At the annual meeting in Charleston, Nov. 22, the following directors were chosen: A. F. Ravenel, C. O. Witte, W. B. Smith, Charleston, S. C.; B. D. Townsend, Cheraw, S. C.; John B. Palmer, Charlotte, N. C.; R. B. Bridgers, Wilmington, N. C.; W. T. Walters, Baltimore. The board elected A. F. Ravenel, President.

Red River & Mississippi.—This company was organized at Shreveport, La., Nov. 15, by the election of the following directors: R. H. Lindsay, E. Jacobs, N. Gregg, J. J. Horan, A. B. George, W. H. Wise, T. H. Morris, J. G. McWilliams, W. A. Drake, J. M. Hollingsworth, R. H. Howell, J. M. Foster, Wm. Robson, S. J. Ward, R. Kahn. The board organized by electing J. M. Foster, President; J. J. Horan, Vice-President; A. Currie, Secretary; R. B. Deming, Treasurer; N. C. Blanchard, Attorney.

Savannah & Memphis.—Messrs. P. P. Dickinson and Wm. S. Greene have been appointed Receivers. Mr. Dickinson is President of the company, and Major Greene is Superintendent of the road.

Sioux City & Pembina.—The following officers have been elected for the ensuing year: President, A. W. Hubbard; Vice-President, T. J. Stone; Secretary, A. H. Morrison; Treasurer, C. G. Wicker; Auditor, C. H. Longman; Superintendent, G. E. Merchant. The road is worked by the Dakota Southern.

Southwestern, of Minnesota.—The first board of directors is as follows: H. W. Holly, A. C. Dunn, T. Jarvis Edwards, Geo. Thorne, E. Olson, J. A. Armstrong, J. W. Corning, W. R. Bennett, M. B. Soule, R. B. Johnson, G. B. Kingsley.

Stamstead, Shefford & Chamblay.—At the annual meeting in Waterloo, P. Q., Nov. 14, the following directors were chosen: L. T. Drummond, G. G. Stevens, J. Gregory Smith, Worthington C. Smith, Ralph Merry, Gny C. Noble, John G. Cowie, Jed P. Clark, Joseph R. Langdon. The board elected officers as follows: L. T. Drummond, President; G. G. Stevens, Vice-President; H. L. Robinson, Treasurer; John P. Noyes, Secretary. The road is worked by the Central Vermont.

Toledo, Union & Cincinnati.—The first board of directors of this new company is as follows: Joseph Boemer, Carey A. Evans, R. S. Fisher, Joseph W. Hunt, W. K. Smith, John T. Starbuck, D. L. Williams.

Wilmington, Columbia & Augusta.—At the annual meeting in Wilmington, N. C., Nov. 20, the old board was re-elected, as follows: R. B. Bridgers, Wilmington, N. C.; John B. Palmer, Charlotte, N. C.; L. D. Childs, Columbia, S. C.; J. Don Cameron, Harrisburg, Pa.; George S. Brown, W. H. Graham, B. F. Newcomer, H. B. Short, S. M. Shoemaker, W. T. Walters, Baltimore. The board elected R. B. Bridgers President; John B. Palmer, W. T. Walters, Vice-Presidents.

PERSONAL.

—Hon. John V. L. Pruyn, of Albany, N. Y., died at Clifton Springs, N. Y., Nov. 21, at the age of 72 years. Mr. Pruyn was several years a director and counsel of the Mohawk & Hudson Company and he was a director and Treasurer of the New York Central from the foundation of that company until the Vanderbilt interest secured control. He was at one time Chancellor of the University of the State of New York, and represented the Albany district several years in the State Senate and afterwards the National House of Representatives.

—Mr. Jonas Livingston, President of the Monadnock and the Peterboro & Hillsboro companies, died suddenly of heart disease at his residence in Peterboro, N. H., Nov. 22.

—Mr. Wm. Ritchie, for 30 years Auditor of the Western Railroad Company and its successor, the Boston & Albany, died suddenly of heart disease at his residence in Springfield, Mass., Nov. 25.

—It is reported that the position of General Manager of the Hannibal & St. Joseph Railroad has been offered to Mr. George S. Dunlap, of Chicago, well known from his connection with the Chicago & Northwestern.

—Mr. J. B. Buchanan has resigned his position as General Superintendent of the Quincy, Missouri & Pacific Railroad. The board accepted his resignation and passed the following resolutions:

"Resolved, That in dissolving our business relations with J. B. Buchanan, Esq., by the acceptance of his resignation of the office of General Superintendent of our road, which he has held for the past five years, we lose an officer whose integrity is beyond question and whose competency and efficiency as a railroad manager, we fully endorse and commend."

"Resolved, That a copy of these resolutions bearing the official seal of the President and Secretary, together with the official seal of the company be handed to Mr. Buchanan."

—Mr. George Grinnell, one of the original incorporators and the first President of the Troy & Greenfield Railroad Company, died last week at his residence in Greenfield, Mass., in his 91st year. Mr. Grinnell was for many years one of the most prominent lawyers in Western Massachusetts; he was several years in the State Legislature and represented his district in Congress for ten years. He was always an active, as he was almost the earliest, advocate for the construction of the Hoosac Tunnel.

—Mr. Onalow Stearns, for some years past President of the Old Colony Railroad Company, declines a re-election, on account of ill health.

TRAFFIC AND EARNINGS.

Railroad Earnings.

The following are reports made to the Ohio Railroad Commissioner for the year ending June 30, 1877:

	Earn- ings.	Ex- penses.	Net earn'gs.	Earn. P. c. per mile. exps.
Ashtabula, Youngstown & Pittsburgh.....	\$242,201	\$157,927	\$84,274	\$3.860 65.21
Cincinnati, Sandusky & Cleveland.....	655,420	530,672	124,748	3.441 80.97
Cleveland & Pittsburgh.....	2,288,023	1,381,256	906,767	10.134 60.37
Cleveland, Tuscarawas Val- ley & Wheeling.....	406,004	283,860	122,144	4.904 57.23

The following are reports of Connecticut and Massachusetts companies for the year ending Sept. 30:

	Earnings.	Expenses.	Net earnings.	Earnings P. c. per mile. exps.
Boston & Providence.....	\$1,373,361	.....	.....	.....
Grand Central.....	3,686	3,217	469	1.229 86.95
New Haven & Derby.....	96,287	78,865	17,392	7.406 78.92
Naugatuck.....	609,697	275,740	227,927	8.267 54.71
Worcester & Shrewsbury.....	7,997	5,778	2,219	2.962 72.23

Other earnings are reported as follows:

Year ending Sept. 30:	1876-77.	1875-76.	Inc. or Dec.	P. c.
Erie.....	\$14,708,990	\$15,852,461	Dec. \$1,143,571	7.2
Expenses.....	10,899,840	12,231,202	Dec. 1,331,362	10.9
Net earnings.....	\$3,809,050	\$3,621,259	Inc. \$187,791	5.2
Earnings per mile.....	15,215	16,896	Dec. 1,681	8.3
Per cent. of exps.....	74.10	77.16	Dec. 3.06	4.1
Washington & Ohio.....	96,399	101,640	Dec. 5,241	5.2
Expenses.....	69,351	69,167	Inc. 184	9.8
Net earnings.....	\$27,048	\$38,473	Dec. \$11,425	29.7
Earnings per mile.....	1,863	1,964	Dec. 101	5.2
Per cent. of exps.....	71.94	62.15	Inc. 9.79	15.8

Ten months ending Oct. 31:

	1877.	1876.	Inc. or Dec.	P. c.
Burlington, Cedar Rapids & Northern.....	\$981,341	\$942,675	Inc. \$38,666	4.1
Net earnings.....	316,408	213,760	Inc. 102,648	48.0
Per cent. of exps.....	67.78	77.30	Dec. 9.52	12.3
New Jersey Midland.....	571,713	548,617	Inc. 23,096	4.2
Net earnings.....	123,005	.....	.....	.....
Per cent. of exps.....	78.48	.....	.....	.....
Philadelphia & Erie.....	2,561,801	2,746,786	Dec. 184,985	6.7
Net earnings.....	845,168	883,141	Dec. 37,973	4.3
Per cent. of exps.....	67.01	67.85	Dec. 0.84	1.2
Month of June:				
Denver & Rio Grande.....	\$57,502	.....	.....	.....
Net earnings.....	24,804	.....	.....	.....
Per cent. of exps.....	56.86	.....	.....	.....
Month of July:				
Denver & Rio Grande.....	\$74,276	.....	.....	.....
Net earnings.....	41,000	.....	.....	.....
Per cent. of exps.....	43.86	.....	.....	.....
Month of September:				
Chicago & Iowa.....	\$52,282	\$45,908	Inc. \$6,374	13.8
Net earnings.....	22,186	17,018	Inc. 5,168	30.4
Per cent. of exps.....	61.81	62.94	Dec. 1.13	2.6
Month of October:				
Philadelphia & Erie.....	\$393,151	\$337,223	Inc. \$55,928	16.6
Net earnings.....	207,338	154,367	Inc. 52,971	34.3
Per cent. of exps.....	47.28	54.23	Dec. 6.95	12.6
Second week in November:				
Denver & Rio Grande.....	\$19,232	.....	.....	.....
St. Louis, Iron Mt. & Southern.....	120,500	120,072	Inc. \$428	0.4
Week ending Nov. 16:				
Great Western, of Canada.....	\$91,335	\$73,864	Inc. \$17,471	23.6
Week ending Nov. 17:				
Grand Trunk.....	\$211,106	\$193,858	Inc. \$17,248	8.9

Coal Movement.

Coal tonnages for the week ending Nov. 17 are reported as follows:

	1877.	1876.	Inc. or Dec.	P. c.
Anthracite.....	499,821	570,401	Dec. 70,580	12.4
Semi-bituminous.....	72,749	82,897	Dec. 10,148	12.2
Bituminous, Pennsylvania.....	50,458	44,760	Inc. 5,698	12.7

The Erie Railway reports for the year ending Sept. 30 a total of 3,248,110 tons of coal carried, against 3,307,644 tons the preceding year, a decrease of 59,534 tons, or 1.8 per cent.

The receipts of coal by lake at Chicago from the opening of navigation to Nov. 24 were:

	1877.	1876.	1875.	1874.
Anthracite.....	402,109	339,932	318,971	378,362
Bituminous.....	348,312	314,209	272,831	258,595

Grain Movement.

Receipts and shipments of grain of all kinds for the week ending Nov. 17 were, in bushels:

	1877.	1876.	Increase.	P. c.
Lake ports' receipts.....	3,676,648	2,916,023	760,625	26.2
"Shipments.....	3,147,443	3,739,754	407,689	10.9
Atlantic ports' receipts.....	4,077,968	3,663,490	414,478	11.3

Of the shipments from Northwestern markets, 10% per cent. was by rail this year, against 36% in 1876, 33% in 1875, and 11% in 1874.

Of the receipts at Atlantic ports, 59.1 per cent. was at New York, 11.3 at Montreal, 8.8 at Baltimore, 7.4 at Boston, 7.3 at New Orleans, 5.9 at Philadelphia, and 0.2 at Portland.

Water Rates.

Few sailing vessels left Lake Michigan ports during the past week, and many of those which took cargoes of grain did it on contracts to carry to Buffalo and there keep the grain in store in their hulls, deliverable at any time before the opening of navigation next spring, the vessels thus being utilized in the winter as warehouses. There was little or no change in rates, 4% to 5 cents for wheat and 4 to 4 1/2 for corn being the quotations, the highest being given Tuesday last on wheat from Milwaukee.

Canal rates cannot be quoted. The shipments of the week from Buffalo were small, and nearly all for local points, as the canal might freeze up before boats could get through. Arrivals in New York by the North River have continued large, and probably will be for some time yet.

Ocean rates have been generally firm. Tuesday contracts were reported at 7 1/2 d. per bushel for grain and 2s. 6d. per barrel for flour by sail from New York to Liverpool, and 8d. per bushel and 3s. 3d. per barrel by steam. Other articles by steam to Liverpool were 40s. per ton for cheese, 35s. per ton for bacon, 23s. 9d. per ton for oil cake, 4s. per barrel for apples, 1/2 d. per pound for cotton. By sail to Cork for orders, grain 6s. 4 1/2 d. per quarter; petroleum, 4s. 10 1/2 d.

THE SCRAP HEAP.

Railroad Wages in Bohemia.

The Consul of the United States at Prague writes to the Department of State that in view of the recent railroad strikes in Pennsylvania, Ohio and Illinois, he has taken the trouble to complete a table of the wages paid to persons employed on the Bohemian railroads. Their compensation is made up of several items, such as wages, rent allowance, compensation for dis-

tance run, and for the saving of coal and oil. Enginemen thus get 1,000 to 1,335 Austrian florins per annum (\$470 to \$627). Firemen receive from 600 to 685 florins (\$232 to \$330). Conductors are divided into two classes, the lowest receiving more than the firemen, and the highest less than the enginemen. Blacksmiths, car-builders, boiler-makers and other skilled mechanics receive from 1 florin to 1 1/2 (47 to 71 cents, silver) for a day's work of ten hours, while the common laborer is paid but 1/3 of a florin, or about 43 cents.

An Engine Pulled Over the Blue Ridge.

The Morganton (Burke County, N. C.) Blade says: "We went up last week to see Wilson's negroes pull that engine over the Blue Ridge and they did it. Stripping the locomotive 'Salisbury' to its lightest weight, 17 tons, they struck out along the stage road, laying a temporary track before them and dragging the engine, by means of three long ropes attached, in front, after them. When the machine was pulled up to the end of this track, they took up all behind and moved it forward, when another pull was made, and so on till the top was reached. From this point, to make the descent on the other side, they had to put on their holding-back straps; but the engine was safely placed in position on the track in the western approach to the main tunnel. This is the first locomotive engine ever west of the Blue Ridge in North Carolina.

Missouri, Kansas & Texas Car Report.

Master Car Builder J. C. Barber, of this road, reports as follows for September:

	Passenger.	Loaded freight.
Total mileage of trains.....	58,443	133,648
Total mileage of cars.....	296,122	2,105,192
Average number of cars per train.....	5.3	15.7
Cost of car repairs per train mile.....	14.31 cts.	8.00 cts.
Cost of repairs per car mile.....	2.32 "	0.51 "
Total cost of repairs.....	\$3,365 21	\$10,699 74
Mileage of Pullman cars.....	60,540	.....
Cost of Pullman car repairs per mile.....	3.05 cts.	.....

The total cost of Car Department, including all expenses, was \$19,064.95. In computing freight car mileage three empty cars are rated as two loaded ones.

Steam Towing on the Erie Canal.

The Utica Herald of Nov. 26 says: "About one year ago the Herald gave extended notice to the experiments made in Utica by the Stephenson Steam Canal Boat Company, represented by Chief Engineer T. S. Farmer, of Oshkosh, Wis. The system it will be remembered provides for the use of an ordinary T rail of iron on the berme bank of the canal, upon which a heavy traction wheel of the Stephenson steam tug, invented for this special purpose, revolves as it tows five or six ordinary canal boats. The experiments were made upon a temporary track laid in the eastern part of Utica under the authority of the Legislature. They were witnessed by members of the Canal Board, engineers, forwarders, representatives of the

New York Chamber of Commerce, members of the Legislature, expert mechanics and citizens generally. As the season was late the trials were not as extended as was desired, but the results attained were very satisfactory.

"In June, the Legislature authorized the laying down of the necessary track for the operation of the Stephenson system, along the whole line of the berme bank of the canal from Buffalo to Albany, a distance of 350 miles. A stock company was organized with a capital stock of \$10,000,000, under the laws of Wisconsin, with headquarters for the present at Milwaukee. The bulk of the stock taken thus far has been disposed of in Europe and the West, comparatively little being taken in New York. The company will meet in New York city this week for the election of officers and the transaction of other important business.

"Chief Engineer Farmer arrived in Utica on Saturday morning. In an interview, a reporter of the Herald obtained the following facts:

"It is hoped eventually to place the tracks upon both banks of the canal, but for the present it will only be built upon the berme bank. As the tugs are 'double-headers' they can tow both ways, west-bound trains of boats giving way to east-bound trains, or vice versa, when they meet. The rails will be laid upon the banks or upon piles (about 14 feet in length) driven in the bed of the canal, the latter plan being necessary where bridges or other obstructions are built upon the bank. At first, seventy steam tugs, improved in many respects over that used in the Utica experiments last year, will be operated. They will each have a capacity for towing from four to six ordinary-sized loaded canal boats, with cargoes averaging 240 tons each. These will be moved at an average rate of about four miles an hour. In returning with light boats a speed of five or six miles per hour will be made. The estimated expense of putting this system into operation from Buffalo to Albany is about \$2,500,000. The expense for the track or tramway will be about \$1,000 per mile. The cost of each steam tug will be about \$5,000.

"The time for commencing the work will be fixed at the meeting to be held in New York this week. It is expected to have about half of the line laid before the close of navigation next season. The depth of water between Lockport and Buffalo will admit of the use of lake tugs, until the company is ready to lay the rails on that section. It is possible that the work may be commenced at Lockport and carried on to the east, a goodly portion to be done this winter.

"Engineer Farmer is confident that with this system in full operation the carrying capacity of the Erie Canal can be increased over one-fourth, and the rates for towing greatly reduced. If six boats can be towed by one tug, the crew of each boat need not consist of more than one man and a boy; time will be utilized and drivers and horses may be dispensed with altogether. The system will have a fair trial, and its operation will not interfere in the least with the present system of horse towing."

RAILROAD EARNINGS IN OCTOBER.

Name of Road.	Mileage.					Earnings.					Earnings per Mile.	
	1877.	1876.	Inc.	Dec.	Per c.	1877.	1876.	Increase.	Decrease.	Per c.	1877.	1876.
Atchison, Topeka & Santa Fe.....	741	711	30	.....	4.2	\$340,242	\$285,098	\$55,154	.....	19.3	\$459	\$401
Burlington, Cedar Rapids & Northern.....	434	368	66	.....	15.2	171,533	111,441	60,092	.....	53.9	405	303
Cairo & St. Louis.....	146	146	.....	.....	.....	24,096	30,510	.....	\$6,414	21.0	105	209
Central Pacific.....	1,818	1,632	186	.....	11.4	1,696,000	1,888,066	.....	192,066	10.2	933	1,157
Chicago & Alton.....	679	650	29	.....	4.5	447,781	532,867	.....	85,086	16.9	659	820
Chicago, Milwaukee & St. Paul.....	1,402	1,400	2	.....	0.1	1,183,000	817,259	365,741	.....	44.7	844	584
Cleveland, Mt. Vernon & Delaware.....	187	187	.....	.....	.....	37,066	36,523	543	.....	1.5	239	235
Dakota Southern.....	300	206	94	.....	45.6	32,468	26,461	6,007	.....	22.7	416	339
Denver & Rio Grande.....	296	296	.....	.....	.....	220,000	188,976	31,024	.....	16.4	743	639
Hannibal & St. Joseph.....	707	707	.....	.....	.....	884,367	526,247	358,120	.....	11.8	832	744
Illinois Central, Illinois lines.....	344	344	.....	.....	.....	119,063	138,811	.....	19,748	14.2	346	404
Indianapolis, Bloomington & Western.....	516	507	9	.....	1.8	181,236	154,838	26,398	.....	17.1	351	305
International & Great Northern.....	673	673	.....	.....	.....	400,625	345,360	55,265	.....	16.0	595	515
Kansas Pacific.....	804	804	.....	.....	.....	609,685	647,922	.....	38,237	6.3	893	806
Michigan Central.....	738	738	.....	.....	.....	329,531	335,375	.....	5,844	1.7	419	417
Missouri, Kansas & Texas.....	429	429	.....	.....	.....	394,972	371,382	23,590	.....	6.1	926	872
Missouri Pacific.....	527	527	.....	.....	.....	231,800	264,507	.....	32,707	12.4	440	502
Mobile & Ohio.....	349	341	8	.....	2.3	172,383	143,525	28,858	.....	20.1	494	421
Nashville, Chattanooga & St. Louis.....	86	86	.....	.....	.....	72,931	70,165	2,766	.....	3.9	849	816
Paducah & Memphis.....	115	115	.....	.....	.....	17,306	21,195	.....	3,889	18.3	150	184
Philadelphia & Erie.....	288	288	.....	.....	.....	393,151	337,223	55,928	.....	16.6	1,365	1,171
St. Louis, Alton & Terre Haute-Belle- ville Line.....	71	71	.....	.....	.....	61,699	50,977	10,722	.....	21.0	869	718
St. Louis, Iron Mountain & Southern.....	685	685	.....	.....	.....	512,200	437,903	74,297	.....	17.0	748	639
St. Louis, Kansas City & Northern.....	830	830	.....	.....	.....	347,940	326,509	21,431	.....	6.3	656	620
St. Louis & San Francisco.....	328	328	.....	.....	.....	134,632	151,494	.....	16,862	11.1	410	462
St. Louis & Southeastern.....	356	356	.....	.....	.....	114,414	112,916	1,498	.....	1.3	322	317
Southern Minnesota.....	170	170	.....	.....	.....	110,000	68,359	41,641	.....	60.9	647	402
Toledo, Peoria & Warsaw.....	237	237	.....	.....	.....	115,167	137,979	.....	22,812	16.5	486	582
Wabash.....	688	628	60	.....	9.6	516,115	439,710	76,405	.....	17.4	750	700
Totals.....	14,727	14,253	474	.....	3.3	\$9,718,970	\$9,047,465	\$1,056,505	\$386,328	7.4	\$659	\$635
Total increase.....	.....	.....	474	.....	3.3	.....	.....	.....	.....	.....	.....	.....

RAILROAD EARNINGS, TEN MONTHS ENDING OCTOBER 31.

Name of Road.	Mileage.					Earnings.				Earnings per mile.					
	1877.	1876.	In.	Dec	Per c.	1877.	1876.	Increase.	Decrease	P. c.	1877.	1876.	Inc.	Dec.	P. c.
Atchison, Topeka & Santa Fe...	720	694	26	...	3.7	\$2,094,660	\$2,043,473	\$51,186	...	2.5	\$2,909	\$2,944	...	\$35	1
Burlington, Cedar Rapids & Northern...	375	368	7	...	1.9	981,341	942,675	38,666	...	4.	2,617	2,562	\$56	...	1
Cairo & St. Louis	346	348	...	...	...	199,898	226,082	...	...	11.6	3,090	1,548	...	...	179
Central Pacific	1,770	1,373	397	...	28.7	13,731,107	10,504,362	...	...	1,202,155	8.6	7,759	10,927	3,169	11
Chicago & Alton	479	650	29	...	4.5	753,113	4,318,279	...	...	460,166	11.6	5,538	6,490	955	14
Chicago, Milwaukee & St. Paul	1,402	1,400	2	...	0.1	6,555,466	6,678,652	...	...	123,192	1.8	4,676	4,770	94	1
Cleveland, Mt. Vernon & Delaw.	157	157	...	...	...	818,851	815,836	3,016	...	1.0	2,031	2,012	19	...	1
Denver & Rio Grande	285	164	121	...	73.8	625,411	394,451	290,960	...	87.0	2,194	2,039	155	...	7
Grand Trunk	1,389	1,389	...	...	...	7,312,898	7,942,235	...	...	129,337	1.6	6,625	6,718	93	1
Great Western, of Canada	496	496	...	...	...	3,273,732	3,431,964	...	...	158,292	4.6	6,606	6,919	319	4
Hannibal & St. Joseph	296	296	...	...	...	1,707,291	1,890,721	116,570	...	7.3	5,768	5,374	394	...	7
Illinois Central, Illinois lines	707	707	...	...	...	4,309,477	4,685,176	...	...	385,699	7.8	5,984	6,487	503	7
Indianapolis, Bloom. & West'n	344	344	...	...	...	1,633,730	1,350,592	...	...	222,772	17.7	3,005	3,653	646	17
International & Gt. Northern	516	464	52	...	11.3	1,178,406	1,013,898	164,508	...	16.2	2,393	2,182	98	...	4
Kansas Pacific	673	673	...	...	...	2,677,515	2,500,181	177,337	...	7.1	3,978	3,715	263	...	7
Missouri, Kansas & Texas	786	786	...	...	...	2,644,115	2,595,927	48,188	...	1.9	3,364	3,303	61	...	1
Missouri Pacific	426	426	...	...	...	3,189,991	3,062,264	127,727	...	4.5	4,778	7,165	323	...	4
Mobile & Ohio	527	527	...	...	...	1,423,087	1,805,114	...	...	82,057	5.5	2,700	2,886	166	8
Nashville, Chattanooga & St. Louis	344	341	3	...	0.9	1,427,413	1,411,487	15,926	...	1.1	4,149	4,159	10	...	0
New Jersey Midland	86	86	...	...	...	571,713	548,517	23,196	...	4.2	6,648	6,378	270	...	4
Paducah & Memphis	115	115	...	...	...	151,720	171,368	...	...	19,648	11.5	1,319	1,490	171	11
Philadelphia & Erie	288	288	...	...	...	2,661,801	2,746,786	...	...	184,985	6.7	8,895	9,537	642	6
St. Louis, Alton & Terre Haute	71	71	...	...	...	427,040	395,793	31,247	...	7.9	6,015	5,575	440	...	7
Bellville Line	665	665	...	...	...	3,517,450	3,043,949	473,501	...	15.6	6,135	4,444	691	...	15
St. Louis, Iron Mt. & Southern	530	528	5	...	1.0	2,678,314	2,593,963	...	...	15,649	0.6	4,885	4,941	76	1
St. Louis, Kansas City & North'n	328	328	...	...	...	1,097,668	1,103,174	...	...	5,506	0.5	3,346	3,363	17	0
St. Louis & San Francisco	386	356	...	...	...	912,178	901,213	10,965	...	1.2	2,662	2,581	31	...	1
St. Louis & Southeastern	170	170	...	...	...	535,624	506,663	28,961	...	5.1	3,151	2,996	153	...	5
Southern Minnesota	237	237	...	...	...	925,895	1,212,612	...	...	286,717	23.6	3,907	5,117	1,210	25
Toledo, Peoria & Warsaw	630	622	11	...	1.7	3,736,536	3,645,038	91,498	...	2.2	5,832	5,804	28	...	0
Wabash	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Totals	15,543	14,292	651	...	4.4	75,949,417	77,821,244	\$1,690,442	3,362,269	2.2	\$4,880	\$5,206	\$326	6	...
Total increase or decrease	...	...	651	...	4.4	...	...	...	1,871,827	2.2	...	...	...	...	...

OLD AND NEW ROADS.

Ashley River.

The South Carolina Circuit Court has set aside the objections made to the proposed crossing of this road over the track of the South Carolina Railroad. The Court decided to allow the crossing and directed that a special jury be drawn to assess the amount of damages, according to law.

Atchison & Nebraska.

A plan of reorganization has been adopted by the directors of this company, and is submitted to bondholders for their approval. The bonded debt is \$3,750,000, and coupons overdue, including March, 1878, \$1,425,000; the road earned net, in 1876, \$78,212, which is assumed as a minimum, and on this basis it is proposed to issue new 30-year 7 per cent bonds, for 30 per cent. of the face of the old bonds, giving the 70 per cent. balance in stock of the new company. For the coupons overdue to March, 1878, 50 per cent. is to be given in stock, and then the new company will stand thus: Bonds, \$1,125,000; stock, \$3,337,000.

Atlantic, Mississippi & Ohio.

At Norfolk, Va., Nov. 23, a hearing was begun on a number of claims presented for supplies and labor furnished before the appointment of the receivers. The case comes up at this session chiefly for the purpose of settling the standing of these claims. The bills presented included that of the Pennsylvania Steel Company for rails; a claim for iron rails and fastenings; some smaller bills for supplies; a number of bills for wood furnished to the company, and a large number of claims for wages, which have been sold or assigned to other parties by the original claimants. The claims for wages not assigned have been, we believe, mostly paid under order of the Court.

Counsel for the consolidated bondholders also presented a petition that authority be given to the Receivers to extend for 10 years the time of payment of the principal of the divisional bonds already due and soon to become due, provided the holders of such bonds agree to the extension. Objections to the granting of the petition were presented by counsel for the trustees under the divisional mortgages, and the Court reserved its decision.

Baltimore & Ohio.

The lease held by this company of the Washington County Railroad expires Jan. 1, 1878, and the Baltimore & Ohio Company has given notice that it will not continue to work the road upon the present terms, which include the payment of 6 per cent. interest on the stock. The Washington County Company desires a continuance of the lease, and has appointed a committee to confer with President Garrett upon the matter. The road is 24½ miles long, from Hagerstown, Md., to a junction with the Baltimore & Ohio.

Boston & New York Air Line.

This company has just placed 300 tons of new steel rails on its line, making 600 tons of steel laid in the track this season.

Boston & Providence.

At the annual meeting in Boston, Nov. 21, the directors were authorized to issue the company's notes, having not more than ten years to run and to an amount not exceeding \$800,000, to take up maturing debt. This action merely authorizes the renewal of a part of the company's debt, which is in the form of long interest-bearing notes.

Burlington, Cedar Rapids & Northern.

It is officially stated that this company has leased 12½ miles of the Minneapolis & St. Louis road, from the Iowa State line to Albert Lea, Minn. The rental to be paid is the interest on \$150,000 of the 7 per cent. bonds of the Minneapolis & St. Louis Company, which are guaranteed by the lessee. The Burlington, Cedar Rapids & Northern Company has built some 33½ miles of new road in Iowa, which is not covered by any mortgage. The floating debt is now about \$300,000, and can, it is expected, be paid off from the earnings of the road.

Central Branch, Union Pacific.

Work has been progressing rapidly for some time on the extension of this road westward into the Republican Valley. Track is laid from Greenleaf, Kan., where the extension leaves the present line west by south to Clifton, about 20 miles. The road is nearly completed from Clifton to Clyde, eight miles further, and the company hopes to have cars running to Concordia, 43 miles from Greenleaf, by the end of the year.

Central, of New Jersey.

A meeting of bondholders of the Lehigh & Wilkesbarre Coal Company was held in New York, Nov. 26, to consider the plan of reorganization so far as it relates to their interests. A statement was made by the Receiver, and, after some discussion, a committee was appointed to confer with Receiver Lathrop and other parties in interest. The committee consists of N. S. Barnes, Frederick A. Potts and George G. Havens.

Chicago, Clinton & Western.

A dispatch from Davenport, Ia., says that the Court has finally ordered a sale of this road to satisfy a claim of \$50,000 for rails furnished by the South St. Louis Iron & Steel Company.

Chicago, Danville & Vincennes.

In the United States Circuit Court at Chicago, Nov. 20, a final decree was entered against this company for \$1,823,373.84 in gold, being the amount of deficiency on the decree of foreclosure after deducting the amount realized by the sale of the mortgage property. The judgment is formal and entirely nominal, as it is not possible that the amount can be collected from the old company, which has now no assets.

Chicago, Burlington & Quincy.

This company has begun to sell through tickets from St. Louis to San Francisco and all points on the Union and Central Pacific roads. It now runs two through trains daily over the St. Louis & Rock Island Division from St. Louis, connecting at Monmouth with the through trains from Chicago to Omaha.

Buffalo & Jamestown.

The Buffalo (N. Y.) *Commercial Advertiser* of Nov. 27 says: "It will be remembered that in September last Mr. George S. Wardwell, referee in the suit of the Farmers' Loan & Trust Company, against the Buffalo & Jamestown Railroad Company, sold the road for \$1,000,000 to a committee of the bondholders. Yesterday afternoon in the Supreme Court, Judge Barker presiding, the referee reported, his action and the sale was duly confirmed. An order was also granted fixing the referee's fees at \$1,000, fees of plaintiff's attorneys at \$2,000, and fees of plaintiffs for fees and commissions at \$1,000. And it was further ordered that the referee pay over balance to the plaintiffs to be by them apportioned to the holders of the bonds, taking receipts for the same, and file with his final report, and should the amount in referee's hands be insufficient to pay the amount due to bondholders, etc., the plaintiff to have judgment against the railroad therefor.

"In accordance with the legal proceedings, the sale of the road was consummated this morning, and it passed into the hands of the bondholders. The new organization will be perfected without delay, and officers and directors will probably be elected in a few days."

Cincinnati Southern.

It is probable that the track on this road will be extended from Somerset, Ky., southward 20 miles to the Crooke coal

mines. Three miles of track are already laid south of Somerset; the grading and masonry are all done, and the iron bridge over the Cumberland River, 1,253 feet long, has been erected. The material for the ballast is all on hand. The work to be done, besides laying the track, is the repair of some damage by washes and the erection of six trestles, the foundations for which are complete. The whole cost is estimated at \$150,000, and it is believed that the extension will secure a considerable traffic from the Cumberland River, which is navigable up to the bridge. It will also enable the company to secure a supply of fuel cheaply from the Crooke mines, as there is no coal on the line north of Somerset. The trustees have no money, but it is thought that the Common Carrier Company will advance the amount needed, in view of the advantages expected from the extension.

Columbus & Coal Valley Extension.

A company by this name has filed articles of incorporation in Ohio to build a narrow-gauge road from Columbus east by south to McConnellsville in Morgan County, about 65 miles. The capital stock is fixed at \$200,000. The road is to be an extension to the Hocking Valley coal fields of the projected Columbus & Northwestern line.

Denver & Rio Grande.

The Auditor's report for July is as follows:

Freight earnings	\$45,606 38
Passengers	28,569 46
Miscellaneous	100 60

Total (\$247.59 per mile)	\$74,276 44
Expenses (43.86 per cent)	32,676 02

Net earnings (\$188.67 per mile) \$41,600 42

Of the gross earnings \$2,519.02 were from troops, mails and Government freight.

Edgefield Branch.

A considerable amount has been subscribed for this road, and nearly all the property-owners of Edgefield have consented to a tax in aid of the road. Application is to be made to the State for convict labor. The road is to run from Edgefield, S. C., to the Charlotte, Columbia & Augusta at Pine House, about eight miles. The Charlotte, Columbia & Augusta is expected to iron and operate the road.

Erie.

A suit has been begun by James McHenry and others in the New York Supreme Court to prevent the execution of the agreement of reorganization. The complainants are holders of first consolidated mortgage bonds, and the complaint alleges that their interests are not properly cared for by the trustee; it charges that the earnings of the road have been sufficient to pay the interest on the bonds, but that they have been misapplied and wasted by the Receiver; that the present receivership was constituted through collusion and fraud, and that the recent decree of foreclosure is oppressive and is intended to coerce bondholders into signing the agreement. They ask for the appointment of a new trustee and a foreclosure of the first consolidated mortgage; for the appointment of a new receiver, and for an injunction against any further action under the reconstruction agreement. A similar suit has been begun in the New Jersey Court of Chancery.

It has been expected that some demonstration would be made at the annual meeting Nov. 27, possibly taking the form of an attempt to prevent any election.

No action of the kind was taken, however, and the old board was re-elected, receiving the votes of 548,702 shares, while 29,927 shares only were voted for several opposition candidates and 281,169 shares were not voted on at all.

The amended scheme of reconstruction was submitted to the stockholders at the meeting.

Foxburg, St. Petersburg & Olarion.

This narrow-gauge road is now completed to Turkey City, Pa., five miles east from the late terminus at St. Petersburg, and nine miles from the junction with the Allegheny Valley at Foxburg. The road is to serve a section of the Clarion oil region.

Georgetown & Camden.

The town of Georgetown, S. C., has voted \$50,000 in aid of this road, and the county has voted \$100,000. An active canvass for subscriptions to the stock is being made all along the line. A convention in aid of the road was held at Sumter last week. The projected line is from Georgetown, S. C., northwest to Camden, nearly 110 miles.

Grand Trunk.

A survey has been made for a branch from Lewiston Junction, Me., to Poland Springs, about four miles. The branch will probably be built next spring, and will be used for summer travel only.

Hawk's Nest & Gauley River.

A company by this name has been organized to build a railroad from the Chesapeake & Ohio at Hawk's Nest, W. Va., by Mill and Rich creeks to the Gauley River, and down that river and the Kanawha to Kanawha Falls, where it will rejoin the Chesapeake & Ohio. The capital stock is \$100,000, with the right to increase to \$500,000. The road will be about 20 miles long, and is intended to serve some local coal and iron interests. The company's office is at Anstead, Fayette County, West Virginia.

Hannibal & St. Joseph.

The Quincy (Ill.) *Whig* says: "A new suit against the management of the Hannibal & St. Joseph Railroad was inaugurated yesterday. The petition for the appointment of a receiver was presented to the Livingston (Mo.) County Court, which was considered and action postponed until February. It is believed that this is only the first step in the new move against the road, intended, probably, to have an influence in shaping the future management. The suit is brought in the name of several of the Western stockholders. Col. R. S. Stevens, General Manager, has been called to New York to meet the officers of the company on official business. It is inferred that he is to be transferred to a new field in order to make room for a superintendent who will be acceptable to all roads connecting with the Hannibal & St. Joe."

Iosco County.

A road is graded from Wells, Mich., on the Jackson, Lansing & Saginaw, 41 miles north of Bay City, northwest 12 miles into Iosco County. The iron for this road has recently been delivered and is now being laid. The road is intended to carry out lumber, and is owned by Thomas Nestor, of East Saginaw.

Levis & Kennebec.

This company gives notice of application to the Quebec Legislature for an amendment to its charter to legalize and define certain acts of the board of directors; also for authority to cancel its outstanding bonds and to make a new issue to take their place.

Louisville, Cincinnati & Lexington.

In accordance with its articles of incorporation the new company has executed a mortgage upon the road to cover an issue of \$1,000,000 new coupon bonds. It is made to Joshua F. Speed, W. B. Caldwell and W. C. Hite, trustees, and has been duly recorded. This mortgage will have a lien upon the property next after the consolidated mortgage generally known as the Green mortgage.

Manchester & Keene.

Work is being pushed as fast as possible on the section of 10 miles between Greenfield, N. H., and Hancock. The object of the company is to complete this section by Jan. 1, in order to secure the bonus of \$20,000 voted by the town of Hancock, which will lapse unless trains are run to that town this year.

Maple River.

The track on this road is now laid from the late terminus at Ida, Ia., southwest 24 miles down Maple River to Mapleton. The road is now 59 miles long from the junction with the Chicago & Northwestern, near Carroll. The line is not very direct, but it is well placed to serve its purpose, which is to open up for settlement a large body of land lying north of the Northwestern road. The road is built by the Iowa Railroad Land Company, which owns these lands, and it will probably be worked by the Chicago & Northwestern.

Meadville & Pittsburgh.

It is proposed to build a railroad from Meadville, Pa., westward by way of Shermansville and Conneaut Lake to a point on the Erie & Pittsburgh road near Linesville, a distance of about 14 miles. It is claimed that the road could be cheaply built and would command considerable traffic, besides giving Meadville better connections with Pittsburgh and with Lake navigation at Erie.

Meetings.

Meetings will be held as follows:

New York, Providence & Boston, annual meeting, at the office in Providence, R. I., Dec. 12, at 10 a. m.
Boston & Maine, annual meeting, in the City Hall at Lawrence, Mass., Dec. 12, at 10 a. m.

Missisquoi & Black Rivers.

Track is now laid on this road from the Huntington Mines southward to the Waterloo & Magog road at Bolton Springs, P. Q., about 15 miles. The road is to be extended down the Black River to the Grand Trunk.

Missouri, Kansas & Texas.

The Union Trust Company has employed Col. T. Haskins DuPuy, Vice-President of the Mobile & Ohio, to make a thorough inspection of this road and a report upon its present condition. His report, when made, will be submitted to the bondholders. Col. DuPuy begins his inspection this week.

Monadnock.

At the annual meeting, Nov. 20, the stockholders voted to appropriate \$20,000 in aid of the Peterboro & Hillsboro road, on condition that that company gives bond to fulfill the conditions attached to the aid.

Napa City & Clear Lake.

A railroad convention was held in Napa City, Cal., Oct. 25, at which a committee was appointed, which has now reported in favor of constructing a narrow-gauge railroad from tide water at Napa City to Clear Lake, by way of Berryessa; the management to be vested in a board of six directors, three from each county; the profits to be equitably divided; and the grading to be let out in sections of one mile or less, and no Chinese labor to be employed. A survey of the line is to be made at once.

New Jersey Midland.

The earnings for October and the ten months ending Oct. 31, were:

	October.	Ten months.
Passengers	\$11,886 44	\$120,814 38
Freight and mail	44,071 43	379,037 37
Express, mail and miscellaneous	16,873 11	71,871 46

Total	\$72,830 97	\$571,718 21
Working and terminal expenses	62,279 60	448,707 72

Net earnings	\$10,551 37	\$123,005 49
Per cent. of expenses	85.40	78.49

The Receivers' account for October is as follows:

Cash balance, Oct. 1	\$1,047 37
Earnings, as above	72,830 97
Suspense account	2,020 93
Loan account	12,503 00

Total \$88,502 27

Expenses, as above	\$62,279 60
Middletown, Unionville & Water Gap lease	5,000 00
Montclair & Greenwood Lake terminals	1,824 83
Construction, equipment and right of way	4,621 32
Suspense account	2,066 89
Discount, interest and loan account	11,502 17

Balance, Nov. 1 \$1,207 86

As compared with 1876, the gross earnings for October show an increase of \$2,765.58, or 3.9 per cent.; for the ten months an increase of \$23,196.12, or 4.2 per cent. The statements include only actual cash receipts and disbursements.

Newport & Maysville.

Meetings are being held along the line of this road between Newport, Ky., and Maysville, and stock subscriptions solicited with fair success. The company now intends, if it can secure subscriptions enough, to extend the road beyond Maysville to a connection with the Chesapeake & Ohio at Huntington.

Ogdensburg & Lake Champlain.

This company has bought 2,000 tons of steel rails, which are to be laid on the track from Rouse's Point, N. Y., westward. These rails are the first steel laid on the road, and will be sufficient for about 23 miles.

Pacific Railroads and the Government.

A Washington dispatch says that the representatives of the Union and Central Pacific companies have submitted to the Senate Judiciary Committee a proposition to the effect that should the Government not accept the proposition heretofore submitted by the railroad companies, they would leave all matters in dispute to a conference of five eminent citizens, to be appointed two by the Government and two by the companies and these four to select a fifth.

Action in the matter is postponed for the present by the exciting political contest now going on in the Senate.

Pennsylvania.

The October statement of this company is as follows: All lines east of Pittsburgh and Erie for October, 1877, as compared with the same month last year, show a

Decrease of gross earnings	\$794,391
Decrease of expenses	116,514

Net decrease \$677,877

For the ten months of this year ending Oct. 31, compared with the same periods last year, there is:

A decrease of gross earnings	\$5,126,967
Decrease in expenses	2,938,124

Net decrease \$2,208,843

All lines west of Pittsburgh for the ten months of this year show a deficiency in meeting all liabilities of \$364,479, being a gain of \$353,893 during the month of October.

Pittsburgh & Lake Erie.

A dispatch from Youngstown, O., Nov. 23, to the Pittsburgh *Telegraph*, says: "The case of the Lawrence Railroad Com-

pany vs. the Cleveland & Mahoning Valley Railroad Company, which is an important injunction case, and which the Pittsburgh & Lake Erie Railroad is greatly interested in, has just been decided by Judge Sherman in the Court of Common Pleas of this county. By this decision the Pittsburgh & Lake Erie Railroad is allowed to use the old canal bed between this city and the Pennsylvania State line. This decision removes all obstruction to the progress of the new road. Work on all the sections will be commenced immediately and prosecuted vigorously.

Pittsburgh & Lake Erie.

Reference was made briefly last week to a decision giving this company the use of the bed of the old Pennsylvania & Ohio Canal, through an agreement with the Cleveland & Mahoning Valley Railroad Company. The nature of this suit and the decision is more fully explained by the following, from the *Cleveland Herald*: "For some time a case has been on trial in the courts of Mahoning County in which the Lawrence Railroad Company was plaintiff and the Mahoning Railroad Company defendants. Some time since the Pennsylvania & Ohio Canal Company was ousted of all its rights and privileges by the Supreme Court of Ohio, and it was claimed by those through whose land the canal passed that the land at once reverted to them, and each claimed full value and damages should the same ever be appropriated for corporation uses.

"In 1873, when the Mahoning Railroad Company was making efforts to extend its road to Pittsburgh, it purchased all the property of the Pennsylvania & Ohio Canal from their trustees appointed by the Supreme Court. The Lawrence Railroad Company in the meantime purchased several parcels of the land from those who claimed the land upon the ouster, and paid for it, and made preparations to build their road. After its purchase the Mahoning road proceeded to grade its land, and the Lawrence Company at once got out an injunction to restrain such proceedings. The case went into the courts and a few days since a decision was rendered for the defendants.

"Judge Sherman held that the plaintiff company took no power under its proceedings to authorize the construction of its Lowellville Branch, to construct such branch road, for the reason that the same would be substantially an additional line of railroad between the same termini as its union line. Second—That upon the dissolution of the Canal Company the land occupied by it did not revert to the original owners or their heirs. Third—That the defendants took a full title to said land for public use, by its purchase at judicial sale from the Canal Company's trustees, and dismissed plaintiff's petition."

Portland & Ogdensburg.

It is stated that holders of about \$750,000 out of the \$800,000 first-mortgage bonds of the Maine company have agreed to fund their coupons, as proposed by the company.

Quincy, Missouri & Pacific.

The Quincy (Ill.) City Council has ordered the issue of \$75,000 of the bonds voted to this road. The company expects to use the proceeds of these bonds in grading the first section of 15 miles of the extension from Kirksville, Mo., west. Work is to be begun at once, and a considerable force will be employed.

Red River & Mississippi.

This company was fully organized at a meeting held in Shreveport, La., Nov. 15. The object of the company is to build a railroad from Shreveport east to Monroe, the present terminus of the Vicksburg, Shreveport & Texas road, a distance of 118 miles.

The North Louisiana Company was organized some time ago for the same purpose, but has not succeeded in doing anything so far. An attempt has been made to consolidate the two companies, but has failed thus far, both parties desiring to control the new organization.

San Antonio & Rio Grande.

Representative Schleicher, of Texas, has introduced a bill in Congress for the construction of this projected road by the United States as a Government work for military purposes. The bill proposes to appropriate \$20,000 per mile to build the road from San Antonio west to Eagle Pass or Fort Duncan, about 150 miles.

Salamanca & Bradford.

It is proposed to build a narrow-gauge road from Salamanca, N. Y., by way of Limestone to Bradford, Pa., the centre of the new oil region. The distance is about 15 miles, and the estimated cost \$75,000.

Savannah & Memphis.

This road has been placed in the hands of receivers on application of the bondholders, the Court appointing the President and Superintendent to the position. The company has been in default some time. The road is finished from Opelika, Ala., northwest to Goodwater, 60 miles, and is graded some 20 miles further.

Sioux City & Pembina.

The stockholders have voted to extend this road from its present terminus at Portlandville, Ia., to Canton, Dakota, about 30 miles. The section from Portlandville to Sioux Falls is to be begun at once and finished early in the spring.

Southeastern, of Canada.

The Connecticut & Passumpsic Rivers Company has begun suit against this company to recover \$158,000 claimed to be due for advances and interest. The company has also sued out a temporary injunction to prevent the Southeastern Company from working its road, on the ground that the Passumpsic Company still holds a valid lease of the same, which cannot be broken until the advances made under it are repaid. A number of the Southeastern employees have been arrested and held to bail upon charges of illegally running trains over the road. On the other hand, a number of employees of the Passumpsic Company have been arrested on similar charges at the instance of the Southeastern.

Southwestern, of Minnesota.

A company by this name has been organized to extend the Southern Minnesota road from Winnebago City westward to the Dakota line, a distance of about 120 miles.

St. Louis, Iron Mountain & Southern.

This company gives notice that it will pay, on and after Dec. 1, the coupons due that day on interest certificates, and 50 per cent. on coupons due that day on St. Louis & Iron Mountain (Arkansas Branch) Railroad bonds and on Cairo, Arkansas & Texas Railroad bonds.

Springfield, Jackson & Pomeroy.

It is reported that a syndicate of contractors have offered to complete this road, taking the work already done and some \$200,000 in uncollected stock subscriptions. They will agree to finish and equip the road for \$600,000 in the company's securities and to do the work by Jan. 1, 1879. The track is laid on the road from Springfield, O., to South Charleston, 13 miles, and from Jackson to Waverly, 20 miles.

St. Maurice.

Application has been filed to the Quebec Legislature for a charter for the St. Maurice Railway Company, to build a railroad from the Grand Trunk at Trois Rivières up the St. Maurice to LaTouche Falls.

Toledo, Union & Cincinnati.

A company by this name has been organized to build a rail-

road from Union City, Ind., north to a point on the projected Toledo, Delphos & Indianapolis line in Jay County. The distance is about 27 miles, and the capital stock is to be \$100,000.

Union Railway, Transfer & Stock Yards.

The track of this company's road, better known as the Indianapolis Belt road, is now completed to the connection with the Indianapolis, Cincinnati & Lafayette at North Indianapolis, the connection with that road having been put in last week. The road now extends almost entirely around the city, and has connections with all the railroads entering it. It is 14 miles long, and several miles of second track are already completed. From the nature of the road it has an unusual length of sidings. The stock yards owned by the company are ready for use, and a large business is expected there.

Utah Northern.

A large force is at work on the grading of the extension from Franklin, Idaho, northward, and some ten miles of grading are already done. The company's intention is to have as much of the grading as possible completed this winter, so that track-laying can be begun early in the spring.

Vermont Valley.

The trouble between this company and the Central Vermont still continues. The Valley Company is pressing its claim for rental, desiring to secure payment as soon as possible and fearing that the Central Vermont may go into bankruptcy, in which case a part of the claim may be lost. The Central Vermont now claims that, since the lease was declared void, the only claim that the Valley Company can have is for the net earnings of the road from the time the old and valid lease expired. This, it is claimed, is more than offset by money paid and supplies turned over with the road. All through freight is still withheld from the Valley road, but that company has trusted a considerable amount due the Central and now in the hands of the Cheshire and other companies, causing the Central some embarrassment.

Virginia Freshets.

The heavy rain storm of last week caused unusually high water in the rivers of Virginia, West Virginia and Maryland, and great damage is reported on the upper waters of the Potomac, the Kanawha, the Roanoke, the James and their tributaries. The Virginia Midland road lost the bridges over the Rivanna and Stanton rivers, besides several smaller ones, and is reported much damaged by washes about Lynchburg and also near Danville. The Richmond & Danville road lost the Dan and Stanton river bridges and the road-bed near Danville and at Barksdale and New Boston was badly washed. The Milton & Sutherland road was also badly washed. The Atlantic, Mississippi & Ohio was badly washed between Bonsack's and Salem and also about the New River crossing below Christiansburg. The James River & Kanawha Canal is reported very badly damaged at several points and a heavy loss is feared, but few particulars have yet been received. Lower down the James and about Richmond much damage was done, but the railroads suffered but slightly.

In West Virginia much damage is reported on the New and Kanawha rivers, and through traffic on the Chesapeake & Ohio road was stopped several days by small wash-outs.

Further north the Cumberland Valley road lost five spans of its bridge over the Potomac at Williamsport, Md., with a number of loaded coal cars, which had been run on the bridge to hold it down. The road was also washed near Chambersburg. Travel on the Baltimore & Ohio was temporarily stopped, the track being submerged and washed out at Sir John's Run. Both the Potomac and Shenandoah were very high, and for a time there were some fears for the railroad bridge at Harper's Ferry. It is feared that much damage has been done to the Chesapeake & Ohio Canal.

Later advices report still greater damage to the Virginia Midland, including the loss of a bridge 900 feet long near Amherst, Va., and additional damage near Lynchburg. The Amherst bridge was built after the floods of 1870. The Atlantic, Mississippi & Ohio also loses several bridges near Lynchburg, and the damage to the road about Bonsack's is greater than at first supposed.

The high water reached the lower Roanoke a day later, doing much damage along the river. At Weldon, N. C., the Seaboard & Roanoke bridge was carried away, as were also three spans of the bridge belonging to the Petersburg Railroad. The Wilmington & Weldon road is reported damaged near the Tar River crossing at Rocky Mount.

Western, of North Carolina.

At a recent meeting of the board arrangements were made to settle the judgment recently obtained against the company. Arrangements were also made to continue the contest in the suit brought to recover on the bonds issued by A. J. Jones when President, which, the company claims, were fraudulently issued. A proposition for the building of the extension from Egypt, N. C., to Greensboro was submitted, but its consideration was postponed to the next meeting.

Woodstock.

The suit between this company and the Central Vermont as to the proposed extension of the Woodstock road across the Central tracks at White River Junction, has been put over to Dec. 24 by the Court of Chancery. The case will then come up for a hearing on its merits.

ANNUAL REPORTS.

Old Colony.

This company owns and works the following lines:

	Miles.
Main Line, Boston, by Taunton to Newport, R. I.	67.79
South Braintree to Plymouth	25.94
South Braintree by Middleboro to Main Line at Somerset Junction	37.60
Cape Cod Division, Middleboro to Provincetown	85.77
Total Main Line and extensions	217.10
Milton Branch	3.30
Granite Branch	5.41
Shawmut Branch	2.35
Bridgewater Branch, Abington to Bridgewater	6.99
Easton Branch	1.69
Wood's Hole Branch, Cohasset Narrows to Wood's Hole	17.54
Hyannis Branch, Yarmouth to Hyannis	4.90
Middleboro & Taunton Branch	8.04
Fall River Bridge connection	2.16
Total	286.82
Fall River, Warren & Providence R. R.	52.38
South Shore R. R., Braintree to Cohasset	57.79
Total	396.99

The South Shore road, previously controlled, was consolidated with the Old Colony from April, 1877, but its accounts are included for the whole of the fiscal year covered by the report, that ending Sept. 30, 1877. The company owns, jointly with the Boston & Providence, the Union Freight Railway in Boston, a track connecting its line with other roads entering Boston. It controls the Old Colony Steamboat Company, whose lines run between Fall River, Newport and New York.

The company's lines carry a large suburban traffic, and serve some important manufacturing towns, but much of the country through which they pass yields a very light traffic. On some of the poorest lines, however, there is very considerable summer pleasure travel.

The equipment consists of 50 passenger, 15 freight and 7 switching locomotives, 72 in all; 158 passenger and 27 baggage

cars; 345 box, 24 stock, 356 platform and 72 six-wheel stone cars; 514 coal and gravel cars. It was increased during the year by 10 freight and 10 gravel cars, besides 3 locomotives, 11 passenger, 8 freight and 6 gravel cars acquired with the South Shore road.

The general account (condensed) is as follows:

Stock (\$23,477 per mile)	\$6,733,860 00
Bonds (\$18,578 per mile)	5,322,500 00
Bills payable	939,921 54
Coupons and dividends unclaimed	19,736 17
Connecting lines	32,779 98
Premium on stock	55,648 71
Income account	690,714 69
Total (\$48,153 per mile)	\$13,811,101 09
Construction and equipment (\$39,516 per mile)	\$11,334,082 42
Real estate	293,385 98
Improvement account	140,000 00
Dorchester & Milton Branch	36,937 88
Fall River, Warren & Providence R. R.	345,605 43
Union Freight Ry.	79,814 42
Duxbury & Cohasset stock	8,333 33
Old Colony Steamboat Co. stock	725,500 00
Nantucket & Cape Cod Steamboat Co. stock	30,681 67
Sinking fund for loan of 1880	57,488 90
Bills and accounts receivable	309,464 51
Materials	227,791 48
Cash	219,815 07
Total	13,811,101 09

During the year the bonded debt was increased by \$389,000. The last report of the South Shore road gave its bonded debt at \$275,000, so that the increase, above the South Shore bonds assumed, was \$114,000. During the year \$21,257.07 was added to construction account for land damages; \$25,654 for new wharf in Boston and third track over Fort Point Channel; \$5,953.86 for extending the Hall safety signals, and \$9,084.20 on account of old claims against the Middleboro & Taunton road. The \$1,450,000 of 7 per cent. bonds which matured Aug. 1, 1877, were paid off, and an equal amount of new 6 per cent. bonds, due Aug. 1, 1897, were issued at a small premium. The notes payable are chiefly in the form of time-notes held by corporations, and do not materially differ from the bonded debt.

The work done for the year was as follows:

	1876-77.	1875-76.	Inc. or Dec.	P. c.
Train mileage, passenger	916,904	929,579	Dec.	12.685 1.4
" " freight	402,095	391,210	Inc.	60,885 15.6
" " service	24,001	55,267	Dec.	31,266 56.5
Total	1,343,000	1,376,056	Inc.	14,934 1.2
Passengers carried	4,905,501	4,150,457	Dec.	144,956 3.5
Passenger mileage	59,628,616	59,025,834	Inc.	602,782 1.0
Tons freight carried	715,134	619,663	Inc.	95,471 15.4
Tonnage mileage	21,377,713	17,896,699	Inc.	3,480,914 19.5
Av. pass. train load, No.	65.03	63.50	Inc.	1.53 2.4
Av. freight train load, tons	47.31	45.75	Inc.	1.56 3.4
Cost per mile run	\$1 04	\$1 07	Dec.	\$0 03 2.8

Of the passenger mileage 21.3 per cent., and of the freight mileage 37.3 per cent. was of business to and from other roads. The coal tonnage carried was 156,313 tons, an increase of 24,811 tons, or 18.9 per cent.

The earnings for the year were:

	1876-77.	1875-76.	Inc. or Dec.	P. c.
Passengers	\$1,282,582 97	\$1,310,234 23	Dec.	\$27,651 26 2.1
Express, mail and extra baggage	103,917 47	99,354 55	Inc.	4,562 92 4.6
Freight	788,383 96	712,929 09	Inc.	75,454 87 10.6
Rents	23,051 23	24,663 05	Dec.	1,611 92 6.5
Miscellaneous	10,996 46	59,529 35	Dec.	49,532 89 89.1
Total	\$2,208,932 09	\$2,206,687 37	Inc.	\$2,245 72 0.05
Working exps.	1,360,871 29	1,370,493 74	Dec.	9,622 45 0.7
Taxes, State and local	93,301 46	106,033 61	Dec.	12,732 15 13.0
Total	\$1,454,172 75	\$1,476,527 35	Dec.	\$22,354 60 1.5
Net earnings	\$753,859 34	\$730,159 02	Inc.	\$23,700 32 3.2
Gross earn. per mile	7,098 32	8,091 00	Dec.	992 68 4.9
Net earn. per mile	2,628 34	2,675 60	Dec.	47 26 1.9
Per cent. working expenses	61.63	62.10	Dec.	0.47 0.8
Per cent. exps. and taxes	65.86	66.91	Dec.	1.05 1.6

During the year there was a decrease in passenger earnings but a considerable gain in freight traffic and earnings. Many of the manufactories on the line of the road are still only partly working. No gravel contracts of any account were filled and this business has almost ceased.

During the year three new depots and one engine house were built; a new iron draw put in the bridge over Taunton Great River at Somerset; 4,012 tons of steel and 1,260 tons of new iron rails and 102,435 new ties laid, and 1,217 tons of rails repaired and relaid. All these were charged to expenses, except two-thirds of the steel rails. There were also laid 9,490 feet of new sidings.

The income account for the year may be summed up as follows:

Net earnings	\$753,859 34
Balance of interest account	\$346,378 97
Dividends, 6 per cent.	404,628 00—750,401 97
Surplus for the year	\$349,835 34
Increase of sinking fund, South shore bonds	3,123 09
Premium on bonds sold	11,250 00
Balance of income from previous year	661,884 23
Balance close of year	\$699,714 69

The Union Freight road continues to do an increasing business, though the earnings are not yet enough to offset the expense of new wharf connections, etc.

An unusually large amount was paid for personal damages, and some injustice from juries is complained of. The expenses of the Randolph accident, including amounts paid to employees, were about \$15,000.

The report says: "As was stated in the last annual report, contracts had then been made for a much larger quantity of steel rails than had ever before been laid in a single year, and during the last year 4,012 tons of steel have been laid upon 46 miles of track at a cost of \$211,000, or about \$52.50 per ton. Of this amount \$71,000 has been charged to repairs of road, and the balance has been carried to an improvement account, which it is proposed to extinguish in the next two or three years, by charging a proportionate part to the expense accounts."

"The addition of the cost of the South Shore Railroad to our construction accounts is simply a matter of book-keeping. It enables us to show more accurately the earnings of the property represented by our capital."

"The business of the Fall River, Warren & Providence Railroad continues as heretofore. The new bridge at Fall River has proved a most excellent and durable structure in every respect."

"The business with New York over the Steamboat Line during the early part of the year was quite large. For the past five months the establishment of new competing lines, both passenger and freight, has reduced rates, and, to some extent, increased the amount and diminished the profits of the business. The Old Colony Steamboat Company has paid its usual dividends of 8 per cent., our proportion of which has been credited to interest account. This company has also, out of its past profits, reduced the valuation of its property by \$300,000 during the current year."

Erie Railway.

The report to the State Engineer and Surveyor of New-York for the year ending Sept. 30, 1877, gives the following information. The road worked was the same as during the previous year, with the exception of the addition of about a mile (0.942 mile) of double track road to the Newark & Hudson Branch, acquired from the Delaware, Lackawanna & Western in exchange for other property.

The total mileage worked in 1876-77 was:

Main line (Jersey City to Dunkirk).....	460.029
Branches.....	496.690

Total length worked.....956.719

The main line is all owned by the company, except 30.885 miles leased, from Jersey City to Sufferns. Of the branches, there is

Owned by the company.....	96.548 miles
Leased " ".....	359.498 "
Operated " ".....	39.709 "

Total.....495.755 miles

The total length of road owned by the company is 525.692 miles, and the mileage of main and second track, side track and third rail owned and leased or operated was:

	Owned.	Leased or Operated.	Total.
First track.....	525.692	431.027	956.719
Second track.....	244.043	78.498	322.541
Side track.....	189.446	156.103	345.549
Third rail on through.....	199.859	121.909	321.768
Third rail on sidings.....	44.809	88.067	132.876

Totals.....1,081.365

Two miles of third rail is counted as one mile of track in the totals:

It thus appears that 55 per cent. of the mileage of road and nearly 60 per cent. of the mileage of track worked by the Erie Company is owned by it.

The equipment of the company has been reported as being at the end of September of the last two years as follows:

	1877.	1876.
Locomotives.....	1877.	1876.
In good condition.....	305	200
In fair condition.....	126	216
In bad condition.....	35	52
Broken up.....	39	37

Total.....505

This shows a decrease of two in the number of the engines, but a great improvement in the condition of the stock, 15 being raised from "very bad" to "fair" condition, and 105 from "fair" to "very good."

The car stock is reported as follows:

	1877.	1876.
First-class passenger cars.....	237	241
Second-class and emigrant.....	67	67
Baggage, mail and express cars.....	97	99

Total passenger-train cars.....407

This shows a decrease in the entire equipment of four first-class coaches, 2 baggage, mail and express cars, and 39 freight cars.

The company has 44 engine houses with stalls for 321 engines, 8 machine shops and 8 car-repair shops, the same as the previous year.

The detailed table of cost of road and equipment shows the following totals:

	1877.	1876.	Increase.
Cost.....	\$117,445,120 54	\$117,140,287 47	\$304,832 07

The additions charged to this account last year are as follows:

	1877.	1876.	Increase.
Graduation and masonry.....	\$4,619 83		
Bridges.....	48 98		
Superstructure (including iron and steel).....	248,381 03		
Stations, buildings and fixtures.....	18,730 12		
Engine and car houses, machine shops, machinery and fixtures.....	1,036 10		
Land, land damages and fences.....	21,025 17		
Passenger and baggage cars.....	320 00		
Freight and other cars.....	10,674 84		

Total.....\$304,832 07

No change appears in the share capital and funded debt, but the floating debt, "consisting of loans and bills payable," is shown to have increased during the year by \$728,155.65. The amounts of stock, bonds and floating debt, gross and per mile of road and of track owned are:

	Total.	Per mile.
Stock.....	\$86,536,910	\$164,808
Bonds.....	\$4,271,814	\$8,236
Loans and bills payable.....	1,897,216	\$3,590

Total.....\$142,695,940

This statement, however, does not include several millions of dollars of due and unpaid coupons, and the entire details of the finances of the company will doubtless be more fully and definitely treated in the report to the stockholders which is likely to appear in a few days. Interest is paid on \$13,328,100 of the bonds, or less than one-fourth of the whole amount.

The operations of the company are reported for the entire system worked—956.7 miles of road and 1,829.7 miles of track. They were as follows:

	1876-77.	1875-76.	Inc. or Dec.	P. c.
Train mileage—				
Passenger trains.....	2,988,298	3,201,005	Dec.	212,707 6.6
Freight trains.....	7,686,664	7,507,942	Inc.	178,722 2.4
Working trains.....	105,591	115,401	Dec.	9,810 8.5
Switching engines.....	1,807,445	1,806,117	Dec.	1,328 0.07
Total.....	12,587,908	12,623,365	Dec.	44,457 0.35
Passengers carried—				
No.....	4,887,338	5,042,831	Dec.	155,493 3.1
Freight carried—				
Tons.....	6,182,451	5,972,818	Inc.	210,633 3.5
Passenger mileage.....	170,868,580	163,074,795	Inc.	7,793,785 4.8
Tonnage mileage.....	1,114,586,220	1,040,431,921	Inc.	74,154,299 7.1

Counting a passenger mile as equivalent to two ton-miles, as it is approximately in revenue and expense, there was an increase of 6.6 per cent. in the aggregate traffic last year, as compared with the previous year.

There was less than two months of heavy Centennial traffic in the last year reported—October and November—but there was even less than that in the previous year, that traffic not becoming very large until near the end of August. However, considering the general dullness of passenger business over since the Centennial—hat is, for ten months of the last year reported, it is surprising to see it show an increase compared with the previous year. Of the whole number of tons of freight shipped over the road, 52.6 per cent. was coal last year, against 55.4 the year before; 19.7 was cattle and other farm products, against 21.0 per cent.; 10.7 per cent. was merchandise, against 10.2.

The earnings and expenses of this traffic were:

	1876-77.	1875-76.	Inc. or Dec.	P. c.
Earnings—				
Passengers.....	\$3,320,089 88	\$3,427,626 45	Dec.	\$107,536 57 6.0
Freight.....	10,647,807 38	11,429,929 70	Dec.	782,122 32 6.8
Express.....	332,885 98	308,882 94	Dec.	24,003 96 16.5
Mails.....	345,070 86	400,077 09	Dec.	55,006 23 13.0
Rents.....	16,113 20	60,857 74	Dec.	44,744 54 70.2
Miscellaneous.....	141,922 62	135,087 22	Inc.	6,835 40 6.1
Total Erie Ry. earnings.....	\$14,708,889 92	\$15,862,461 14	Dec.	\$1,153,571 22 7.2

	1876-77.	1875-76.	Inc. or Dec.	P. c.
And from other sources—				
Pavonia Ferry.....	229,631 79	234,286 08	Dec.	4,654 29 2.0
Pavonia horse railroad.....	14,227 47	21,273 18	Dec.	7,045 71 33.1
Erie baggage express.....	62,635 61	70,228 40	Dec.	7,592 79 10.8
Weehawken docks.....	85,817 07	50,509 20	Inc.	35,307 87 69.9
Grand Opera House and 23d st. property.....	40,065 02	26,526 82	Inc.	13,538 20 51.0
Unclaimed baggage and freight dep't.....	2,567 34	2,249 60	Inc.	317 74 14.1
Interest on securities.....	240,708 94	281,260 65	Dec.	40,551 71 14.5
Buffalo, Bradford & Pitts- burgh R. R. royalty on oil.....	13,063 92	970 26	Inc.	12,093 66
Blake's Dock.....	2,773 70	.....	Inc.	2,773 70
Claims prior to Oct. 1, 1876.....	36,177 85	.....	Inc.	36,177 85

Total receipts from other sources.....\$727,668 71

Total Erie Ry. expenses.....\$1,809,839 60

Expenses other than transportation.....\$46,784 30

Reorganization.....\$204,380 66

Pavonia horse railroad.....\$35,367 10

Erie baggage express.....\$56,483 42

Weehawken docks.....\$48,428 03

Grand Opera House and 23d st. property.....\$56,321 23

Unclaimed baggage and freight dep't.....\$4,553 69

Total of above.....\$452,308 43

Claims prior to Oct. 1, 1874.....\$175 13

Taxes (N. J. and Pa.).....\$19,422 81

Judgment for guaranteed interest on Boston, Hartford & Erie bonds.....\$115,153 04

Loss on Buffalo, New York & Erie bonds.....\$44,625 00

Total expenses other than transportation.....\$631,684 41

Total expenses.....\$1,809,839 60

Net earnings.....\$11,531,524 01

NET EARNINGS.....\$3,905,034 62

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NET EARNINGS.....\$3,905,034 62

NET EARNINGS.....\$11,531,524 01

show some important facts concerning bulk of traffic, size of trains, occupation of tracks, etc.:

	1876-77.	1875-76.	1874-75.
Train mileage—			
Per mile of road.....	3,123 1/2	3,380	3,409
Passengers.....	8,034 1/2	7,848	10,017*
Freight.....	13,158	13,216	13,426
Total.....	1,633	1,775	1,964
Per mile of track—			
Passenger.....	4,146 1/2	4,116	5,129*
Freight.....	6,880	7,006	7,083
Total.....			

Equivalent to trains each way daily over whole road—

	1876-77.	1875-76.	1874-75.
Passenger.....	4.28	4.59	4.67
Freight.....	11.00	10.75	13.72
Total.....	18.01	18.10	18.40

* Apparently including freight and switching trains.

	1876-77.	1875-76.	1874-75.
Per mile of road—			
Passenger mileage.....	178,623	170,616	165,404
Tonnage mileage.....	1,165,032	1,088,545	1,082,084
Earnings.....	\$15,846	\$17,008	\$18,415
Working expenses.....	11,886	13,218	14,178
Net earnings.....	3,960	3,790	4,237

Average trainload—

	1876-77.	1875-76.	1874-75.
Passengers, No.....	57.1	61.0	48.5
Freight, tons.....	146.0	138.6	108.6*

* Mileage of work and switching trains being reckoned with that of freight trains in 1874-75 decreases materially the average freight-train load that year.

Per passenger-train mile—

	1876-77.	1875-76.	1874-75.
Receipt.....	\$1 07 1/2	\$1 06 1/2	.....
Expense.....	0 84	0 94 1/2	.....
Profit.....	0 23 1/2	0 12	.....

Per freight-train mile—

	1876-77.	1875-76.	1874-75.
Receipt.....	1 38 1/2	1 52 1/2	.....
Expense.....	1 09	1 22 1/2	.....
Profit.....	0 29 1/2	0 29 1/2	.....

Per passenger carried one mile—

	1876-77.	1875-76.	1874-75.
Receipt.....	1.885 cts.	2.102 cts.	2.227 cts.
Expense.....	1.471 "	1.854 "	1.951 "
Profit.....	0.414 "	0.248 "	0.276 "

Per ton of freight hauled one mile—

Per ton of freight hauled one mile—	0.112	0.225	0.210
Receipt.....	0.955 "	1.009 "	1.209 "